DOCUMENT RESUME

ED 060 415 AC 012 377

AUTHOR	Hartman, Joel A.; Brown, Emory J.
TITLE	Evaluation of a Five-Year Demonstration Farm Program in Two Pennsylvania Counties.
INSTITUTION	Pennsylvania State Univ., University Park. Coll. of Agriculture.
SPONS AGENCY	Tennessee Valley Authority, Washington, D. C.
REPORT NO	ES-43
PUB DATE	Jun 70
NOTE	222p.
EDRS PRICE	MF-$0.65 HC-$9.87
DESCRIPTORS	*Adult Farmer Education; Agricultural Education; Agricultural Research Projects; Bibliographies; Change Agents; Dairymen; Data Collection; *Demonstration Programs; Extension Agents; *Extension Education; Farmers; *Farm Management; Males; Program Effectiveness; Program Evaluation; Research; *Rural Extension; Teaching Techniques; University Extension
IDENTIFIERS	*Pennsylvania

ABSTRACT

This analysis of the impact of a result demonstration educational program was made in an effort to achieve the following goals: (1) identification of the objectives of the educational program; (2) description of the program; (3) assessment of awareness of the program by target clientele; (4) measurement of the amount of change that takes place; and (5) determination of the amount of observed change which can be attributed to the action-educational program and what can be attributed to other known factors. This study is unique in two aspects: (1) the sample of interviewed farmers is one of the largest of any employed in demonstration farm research and represents the universe of dairy farmers in geographical areas immediately surrounding the demonstration farms; and (2) data were collected at two points in time--a benchmark survey of surrounding farmers was completed prior to the beginning of the educational program, and a terminal survey was conducted after the end of the program. The report contains the following chapters: I. Introduction; II. Review of Literature; III. Methodological and Theoretical Orientations; IV. Collection of Data; V. Program Inputs; VI. Methodological Tools; VII. Changes in Practices Adopted; VIII. Dairymen's Knowledge of the Program; IX. Relationship of Program to Change in Practice Usage; X. Summary and Conclusions; and XI. Bibliography. (DB)

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Extension Studies No. 43, June 1970

Evaluation of a Five-year Demonstration Farm Program In Two Pennsylvania Counties

Joel A. Hartman and Emory J. Brown

The Pennsylvania State University, College of Agriculture
Extension Service and Agricultural Experiment Station
in cooperation with The Tennessee Valley Authority

AC012377

EVALUATION OF A FIVE-YEAR DEMONSTRATION FARM PROGRAM IN TWO PENNSYLVANIA COUNTIES

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and

Emory J. Brown**

The authors acknowledge the financial assistance provided by the Tennessee Valley Authority to make this study possible. In addition, we are greatly indebted to the following persons who not only contributed time and effort to explain the program being evaluated, but also provided information in response to a detailed set of questions:

Extension agents in -

Susquehanna County -- Edward J. Diffenbach
Doyle L. Thomas

Indiana County -- Ward M. Stover
Richard H. Ifft

Agronomy specialists - James H. Eakin, Jr.
W. Wayne Hinish

Farm Management specialist - Frederick A. Hughes

Dairy specialists - Joe S. Taylor
Richard S. Adams

The 621 dairy farmers who willingly gave their time and effort to lengthy interviews.

The secretaries and staff of the Statistical Laboratory in the Department of Agricultural Economics and Rural Sociology.

The 16 demonstration farmers in the two counties who provided much counsel, guidance and information to the investigators over the five-year period.

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CHAPTER I

INTRODUCTION

The Problem

The result demonstration has a long history in agricultural education in the United States. As early as 1887 the United States Department of Agriculture employed field agents in various sections of the nation to demonstrate agricultural practices to farmers, generally disease and pest control measures. Seaman A. Knapp is recognized as having popularized the result demonstration method through his now famous boll weevil demonstrations on the W. C. Porter farm near Terrell, Texas.[1] Other educational techniques, such as lectures and bulletins had apparently failed to influence farmers to adopt adequate weevil control measures. It was probably these failures interacting with the importance of the boll weevil menace to cotton production in the South at the time that portrayed dramatically the potential effectiveness of the result demonstration as an educational technique. In any event, within a year of the Terrell demonstrations, an estimated 7,000 demonstrators were following the newly recommended practices for boll weevil control, and those practices gained wide acceptance.

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[1]For a more complete description of the role of demonstrations in agricultural education during the early 1900's, see True (1928), Gilbertson and Gallup (1957), and Sanders (1966).

It is generally recognized that the success of these early demonstrations was instrumental in the establishment of the Cooperative Extension Service. In 1914 the Smith-Lever Act, in establishing federal support for the Federal Extension Service, stated: "Cooperative Agricultural Extension work shall consist of the giving of instruction and practical demonstrations in agriculture and home economics" (Smith-Lever Act, 1962).

Purpose of Demonstrations

The obvious purpose of the result demonstration is to convince people, in this case farmers, that certain recommended practices are applicable to a local situation and that there are advantages in adopting such measures. The rationale underlying this is that although many people are not readily convinced by claims and the reporting of the results of research, they cannot argue with actual results and performance which they themselves see demonstrated. They are inclined to believe and to be influenced by what they see.

From the very beginning, however, there were at least two other important purposes in the use of the result demonstration method. It was used also as a means to increase the confidence of local farmers in the Extension Service, and most particularly in the local extension staff. It was believed that, once a local extension agent had evinced the veritableness of the knowledge at his command through demonstrations, a certain credence would automatically confer upon all else he chose to teach. Second, it has been a method of

discovering and developing local leaders. In contrast to method demonstrations, result demonstrations are conducted by farmers themselves under the supervision of the extension staff. By working closely with these demonstrators, extension educators often uncover and develop characteristics of cooperation and leadership which can be employed to advantage not only in that particular demonstration program but also in other extension and community activities.

There are recognized disadvantages to the result demonstration method. It is often difficult to find well-qualified demonstrators to carry through a demonstration program. In addition, the demand of time in planning, establishing and supervising a demonstration program is disproportionately high in comparison to other methods and in light of the many other demands on extension personnel. Along with this, the direct economic cost per practice demonstrated and per person reached is relatively high. Despite these objections, many observers of extension educational techniques claim that the result demonstration is the most effective method of persuading the least informed and the most skeptical farmers to adopt improved practices (Gilbertson and Gallup, 1957:4).

General Acceptance of Result Demonstrations

The general acceptance of the effectiveness of result demonstrations by extension workers in the years following Knapp's leadership is attested to by the fact that in the late 1920's, 17 percent of extension expenditures were chargeable to result

demonstrations (Baker and Wilson, 1929). This stood second only to method demonstrations, including leadership training, which accounted for 19.6 percent of the extension budget. Wilson and Gallup (1955) used these 1929 figures without revision or explanation in a 1955 United States Department of Agriculture publication evaluating the effectiveness of contemporary extension teaching methods, so that one must assume that these figures were still accepted by the U.S.D.A. at that time as being relatively accurate. In contrast, however, when one considers the relative frequency with which extension methods are reported as having influenced the adoption of improved practices in data gathered from 15,454 farm and home units in 27 states during the period 1923-1941, the result demonstration ranks seventh, accounting for only 8.1 percent of the practices reported having been adopted. Accordingly, the ratio of practices adopted to costs is relatively low, indicating that the result demonstration appears to be an inefficient technique with respect to cost (Wilson and Gallup, 1955:17).

It is, therefore, not surprising that the result demonstration should have received less emphasis as a method of teaching in more recent years. In fact, with respect to the stated purposes of employing the result demonstration method, successful utilization of the result demonstration should tend to reduce the need for continued use of the technique. Nevertheless, the establishment of local applicability of new experiment station and university research

finds is a continuing task of the local extension staff for which the result demonstration seems particularly appropriate. Wilson and Gallup (1955:41) report that

> the trend in the use of result demonstrations in extension teaching has been consistently downward over the years. In 1952 the average county agricultural agent reported 23 result demonstrations supervised. The corresponding figure for 1942 was 35.

But Cook (1966:128) states that

> after over half a century of cooperative extension work, the result demonstration continues to be one of its important teaching methods. . . . For the most part, result demonstrations are now used in situations that involve major changes in established enterprises, methods, habits, or facilities; evaluation of new enterprises or devices: and better selection of certain similar practices, materials, or devices.

TVA Test-Demonstration Program

The direct use of demonstration farms is exemplified in the Test-Demonstration Program conducted by the Cooperative Extension Service in cooperation with the Tennessee Valley Authority.[2]

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[2]The Tennessee Valley Authority was created by Congress in May, 1933, bringing to an end a decade and a half of strife and uncertainty about the disposition of government-owned properties at Sheffield and Muscle Shoals, Alabama. During World War I, two nitrate plants and what was later known as Wilson Dam were constructed on the Tennessee River in northern Alabama at a cost in excess of $100,000,000. Their purpose had been to supplement, if not replace, Chilean imports as the United States' sole source of nitrates for munitions. The war ended before production could begin, however, and in the ensuing years the "Muscle Shoals controversy" over the principle of government versus private ownership was fought with great intensity. For a more detailed discussion of the history of the Tennessee Valley Authority, see Selznick (1949), Hubbard (1961), Lilienthal (1953), and Ball (1939).

The Tennessee Valley Authority Act put into law President

Originally, the test-demonstration programs were all located in the Tennessee Valley area. Since 1935, however, the TVA has sponsored programs in other areas of the United States, and in recent years more than half of the test-demonstration farms are located in states outside the area of the Tennessee River basin. The major purpose has been to introduce the use of improved fertilizers and fertility practices. But a secondary purpose has been to demonstrate systems of farm operations that will increase income, level of management

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Roosevelt's recommendations for the comprehensive development of the Tennessee River basin, an area encompassing parts of seven southeastern states: Kentucky, Virginia, Tennessee, North Carolina, Mississippi, Alabama and Georgia. The Authority was created as a corporate agency of the United States government to work with federal, state, and local agencies and organizations to improve economic conditions in those areas. Section 5 of the Act instructed the Authority to initiate a comprehensive research program at the Muscle Shoals plant to develop new and better fertilizers and to provide necessary information on the effects, values, and best methods of using them.

These instructions are implemented through two programs: (1) TVA cooperates with the Cooperative Extension Service in several states to carry on an educational program in which newly developed fertilizers are introduced within a broader test-demonstration program designed to bring about improvement of demonstration farms and farming practices and demonstrate these improvements and changes to others. (2) On the basis of the results obtained on the test-demonstration farms with the newly-developed fertilizers, TVA works closely with the fertilizer industry in its distributor-demonstration program, in which the new or improved manufacturing processes developed by TVA are made available to commercial fertilizer firms.

skills, and general productivity. The general technique is to work intensively with a few selected demonstration farmers over a five-year period, encouraging them to adopt recommended practices. The assumption is that other neighboring farmers will be influenced by the example of these demonstrators. Bailey (1964:14) quotes Ito:

> It is important to give individual help to a few families who will take the lead. These early adopters are, in effect, the leaders who can interest others by telling their success story and showing the result of their management program.

Justification of This Study

Although there is a substantial body of literature on result demonstrations, most of it is more descriptive than analytical or evaluative. Very few carry their analysis farther than the changes which occur to the demonstrator and on the demonstration farm itself. Those studies which examine the impact of a demonstration program on farmers in the areas surrounding demonstration farms are characterized generally by a lack of rigorous and precise findings. Much of the evidence on diffusion is based on verbal responses collected in cross-sectional surveys. This will be discussed in more detail in Chapter II.

In recent years a higher priority has been given to programs and projects designed to effect economic and social development. This economic and social development implies a wide variety of changes: changes in attitudes and motivation, the introduction of new knowledge and concepts, the acceptance of new skills and technologies, the

reorganization and reallocation of resources, etc. The success of such projects depends on (1) how adequately it has been determined, what particular changes are most needed (2) how well designed the action program to bring about these changes is, and (3) how efficiently the program is administered.

In turn, either one, or all three, of these factors are dependent for their success on the availability of pertinent and relevant data. It would seem logical, then, to assert that the justification of this thesis is its attempt to collect and analyze, in a rigorous manner, data about the changes that a specific program has produced. The information in these data will be related to various elements in the program and its operation. It is generally recognized that our abilities in bringing about change are not highly developed. Therefore, the data presented here can add their useful testimony to a more complete understanding of the result-demonstration as an action technique in the total process of change.

All social institutions involved in public service programs, whether of the educational or of the welfare type, are concerned with proving the effectiveness of their programs. This is particularly true in recent years when a better informed public is reluctant to accept on faith alone the legitimacy and effectiveness of any given services of such agencies as the Tennessee Valley Authority and the Cooperative Extension Service. There is increasing demand for scientific proof of the effectiveness of various programs.

At the same time, if new knowledge is to find its way into new programs, current programs must be evaluated to determine where they fall short of expected or potential achievements and where reallocation of resources can be applied most effectively.

Initiation of the Impact Project

It is precisely these mandates for evaluation which furnished the rationale and the resources for this study. Because of the lack of rigorous evidence as to situations in which the demonstration farm can be used effectively as a technique in managed change, an "Impact Study of the Unit Demonstration Farm Program" was initiated in 1961 by the Agricultural Experiment Station of The Pennsylvania State University in cooperation with the Tennessee Valley Authority. Project Leader was Emory J. Brown, professor of rural sociology and extension education. The educational program to be studied was a test-demonstration program in Indiana and Susquehanna Counties, Pennsylvania. It was begun in 1962 and carried through the harvest season of 1966. County extension staffs worked intensively with 16 cooperating diary farmers in demonstrating recommended practices. Leadership in this "action" phase of the program was provided by university extension specialists, particularly from agronomy and farm management.[3]

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[3]This action program was one of a series of educational programs carried on cooperatively by The Pennsylvania State University and the Tennessee Valley Authority since 1956. It involved the

It is to be recognized immediately that this study is not basic research, which attempts to discover knowledge, by testing hypotheses. One might better designate this study "applied," or more appropriately, "evaluative" research. Its primary objective is to determine the extent to which the educational program under investigation achieved its desired result. It is the utilization of scientific research methods and techniques for providing information which will be the basis for making an evaluation. Consequently, the methodology of evaluative research is not altogether different from that generally associated with the scientific method. It is primarily research, and as such it must adhere as closely as possible to accepted standards of research methodology.

However, as is true with any kind of specialized research, certain variations must occur in the design. One of the problems peculiar to evaluative research is that the investigator usually has far less control over the research situation than does the basic researcher. The administrators of the program under study, by having already defined the objectives of the program, have imposed certain

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periodical establishment of a number of demonstration farms within selected counties in Pennsylvania. The county extension staff, with the assistance of university extension specialists, then built a five-year action educational program around the demonstration farms, with the view that knowledge and recommended practices introduced or emphasized on the demonstration farms would "filter out" to neighboring farmers.

boundaries to the research. In addition, some of the techniques which might produce useful data require a certain amount of interference with the ongoing activities of the program, which gives rise to objection and/or unwilling cooperation on the part of those administering the program. The investigator may request the keeping of extra records or the securing of additional information which is not necessary for the operation of the program but desirable for the research, which in fact was the case with the program under study. There is also the matter of "control" or comparison groups, which are often completely absent. This makes it difficult to determine what observed change can be attributed to the influence of the program. These are some of the problems which make evaluative research difficult and places limitations on the generalizability of the findings of the study.

The Specific Objectives of This Study

No research study can examine all of the pertinent aspects of a problem. The principle of parsimony must be exercised in selecting areas in which the study will be concentrated. Accordingly, this dissertation attempts to achieve the following goals with respect to analyzing the impact of a result demonstration educational program:

(1) Identification of the objectives of the educational program. It is recognized that in all but the most simple of programs there are differing levels of objectives. In many instances these varying levels

of objectives may make up an ordered, step-wise series, in which each becomes a step toward fulfilling the next higher objective, until the ultimate or final idealized objective is achieved. Therefore, one of the primary aims of the investigator is to determine both the ultimate and intermediary objectives of the educational program. The objectives serve to indicate the direction toward which progress in the program should move, and, at the same time, provide the standards by which that progress can be measured.

(2) Description of the program. Before it is possible to determine the results and effectiveness of an educational or action program, it is logically necessary to ask: "The results of what?" Who are the people involved in the program, and within what sort of organizational structure do they operate? What facilities do they have access to and take advantage of? What operational techniques do they employ? What is the educational content of the program? The answers to these questions provide the dimensions of the program which must be known if "inputs" are to be related to "output."

(3) Assessment of awareness of the program by target clientele. It is recognized that diffusion of ideas and practices from the demonstration farms may take

place among target clientele without their awareness of the source of those ideas. A farmer may pass on a new idea to his neighbor or a friend without conveying with it the fact that his own introduction to the idea was on a demonstration farm. Despite this, however, certainly one of the measures of the effectiveness of an educational program is an assessment of the extent to which target individuals are aware of and knowledgeable about the program. Knowledge about the subject matter emphasis of the educational program does not necessarily assume acceptance of that material. It does indicate, however, that the program has succeeded in publicizing itself to its potential beneficiaries.

(4) Measurement of the amount of change that takes place. Just as important as the overall design of any research effort, is the fruitfulness of the measurement techniques employed. Basic to meaningful measurement in evaluative research, however, is determining the appropriate category of effect. Two categories have been used primarily in the evaluative research on extension education programs: 1) assessment of effort, which represents an assessment of input, regardless of output; and 2) assessment of

effect, which measures the results of effort rather than the effort itself. The former is probably the easier to obtain and most frequently employed, since it can often be determined from administrative records. It assumes, however, that the specific activities engaged in are a valid means of reaching the program goals. A more difficult technique, and the one that will be attempted in this thesis, is that of measuring the results or impact of the performance of the activities in the program.

(5) Determination of the amount of observed change which can be attributed to the action-educational program and what can be attributed to other known factors.

An educational program, such as the one being investigated here, is not a controlled, univariate experiment, in which the investigator manipulates the program as an independent variable and nothing else impinges upon the situation to yield an effect on the dependent variable--the desired change. Other factors, some known and many unknown, also have their effect on the change that takes place. By the use of a multiple covariance technique, known systematic variance will be isolated and their effects controlled and the amount of change which can be attributed to factors associated with the program will be measured.

Value of This Study

This study is unique in two aspects. First, the sample of interviewed farmers is one of the largest of any employed in demonstration farm research, and at the same time it represents the universe of dairy farmers in the geographical areas immediately (within four to seven miles, depending on natural boundaries) surrounding the demonstration farms. In most of the other diffusion studies of demonstration farm programs, only a sample of the surrounding farmers was interviewed in an attempt to determine the amount of diffusion from the demonstration farms.

Second, data were collected at two points in time. A benchmark survey of the surrounding farmers was completed prior to the beginning of the educational program, and a terminal survey was conducted after the end of the program. Most other studies which attempt to assess the impact of a demonstration program utilize one survey of the surrounding farmers at the end of the program, asking respondents to recall the changes they have made in the past few years. This study determines actual changes from the raw data, comparing surrounding farmers' situations at the end of the program with what they had been at the beginning of the program.

Because of these two differences, it is expected that this study will provide information not heretofore available on the effectiveness of an educational demonstration program. It is not assumed that the findings will be greatly or totally different from those of other studies, but that the findings which do proceed from the study will be based on evidence collected in a replicative design.

The area of study of this dissertation--the impact of an educational program built around a result demonstration--is but a segment of the larger general area of the diffusion of knowledge and behavioral practices. The writer is indeed fortunate that a great deal of research has been conducted on the adoption of farm practices. This previous work provides a rough outline of the range of factors possibly involved as well as suggesting certain generalizations which lend themselves to the formulating of new hypotheses. In the next chapter the results of some of the more important of this previous research will be summarized briefly. Whatever contribution this study may make toward a more complete understanding of the diffusion process in result-demonstration programs has already been made possible by the studies to be reviewed forthwith.

CHAPTER II

REVIEW OF LITERATURE

As has been pointed out, the result-demonstration has been and continues to be a basic educational technique of the Cooperative Extension Service. However, although there is an extensive body of literature on the use of result demonstrations in agricultural education, the greater portion of it is merely descriptive. Few attempts have been made to evaluate the effectiveness of such demonstrations as an educational technique or to analyze the impact of the demonstration within the total diffusion process (Bailey, 1964).

For example, Orr and Wells (1957) studied 14 test-demonstration farmers in northern Alabama for a period of 16 years, from 1940 through 1955. They looked primarily at the changes in the test-demonstration farmers themselves. Farm size increased over 40 percent, livestock on the farms increased 169 percent, the machinery inventory increased 280 percent, and capital inventory other than land increased 396 percent. These changes were accompanied by an increase in the general level of living of the demonstrators' families. They did not report examining the impact of the program on the surrounding neighborhood nor even comparing the changes on the demonstration farms with those of a control group.

The above report is typical of much of the literature available on result-demonstration programs. The primary intent

seems to be presenting a descriptive chronicle of what happens to the cooperators (demonstrators) in the program. Numerous studies have gone one step further and introduced a control factor. Adams, Taylor and Specht (1965) evaluated four years of the Unit Demonstration Farm in Pennsylvania by comparing the changes on demonstration farms during that period with the changes for the total county in which the farms were located.

A study of Farm and Home Development in North Carolina contrasted the changes made by demonstration families with those made by a control group of non-participating families (Marsh, 1962). Erickson and Graham (1967) paired and compared each demonstration farm in an Illinois program with a nearby farm to evaluate the performance of 63 Illinois test-demonstrators. In general, all these studies report that the demonstrators are significantly different at the end of the program from other farmers in the surrounding neighborhood with respect to net worth, increase in annual earnings, uses of sources of information, leadership participation, etc., if, in fact, they were not at the beginning. The latter is a fact which is taken into account in some studies, and is not in others.

The Influence of Demonstration Farms

A few studies have been concerned with the impact of the result-demonstrations on agricultural practices in the neighborhoods surrounding the demonstration farms. Erickson and Graham, in the

study mentioned above, interviewed a sample of local leaders, businessmen, and neighboring farmers to obtain an evaluation of the effectiveness of the demonstration farm program in disseminating information. The names of the neighboring farmers for their sample, however, were procured from the test demonstration farmers who provided the investigators with a population of names of other farmers in the neighborhood whom they thought had been influenced by the program.

In a Utah study of 66 demonstration farms in 23 counties of that state, the cooperators (demonstrators) themselves appraised the influence of the program (Michaelson, undated). They estimated that 12 percent of the 681 persons who viewed their demonstrations adopted the practices they observed. In the case of one kind of demonstration--the fertilizer demonstrations--they estimated that 22 percent of the 324 people observing the demonstrations adopted the practices.

One of the more rigidly designed studies on the influence of the result-demonstration program is that of Blackmore, Dimit, and Baum (1955). They interviewed 20 randomly selected neighboring farmers around each of 25 test-demonstration farms, for a total sample of 500 non-test-demonstration farmers. They found that the average number of recommended practices adopted was related to the distance of the farmer from the nearest demonstration farm, increasing from one mile to the second mile range, remaining fairly constant for the two- to five-mile range, but declining beyond that point.

Seventeen percent of the farmers interviewed indicated they had been on a tour of test-demonstration farms, and half of those who had been on one or more tours reported having adopted a practice they saw demonstrated there--usually a fertility practice. "Other farmers" was given as the most important source of information on new practices and also the most important influence leading to the trial of new practices. In that vein, test-demonstration farmers were named by 65 percent of the non-demonstrators as the "other farmers" who try new practices and succeed with them.

Rogers and Leuthold (1962) found in Ohio that members of the target audience tended to communicate personally with demonstrators in the same or earlier adopting categories, with a similar or higher social status, and with those who lived within an average of four miles. Seventy percent of his sample knew about the demonstration program.

In a North Carolina study, 52 percent of non-test-demonstration farmers gave the name of a demonstrator as one of the three or four persons visited most frequently (Wilkening and Santopolo, 1952). Sixteen percent of the farmers reported a demonstrator as a source of information about one or more recommended farm practices. But 53 percent of those who had been in contact with a demonstrator said they knew nothing about the TVA demonstration farm program.

According to Wilkinson and Bailey, of 136 Mississippi farmers living within two miles of a demonstration farm, 65 percent had adopted a demonstrated practice (Bailey, 1964:16).

The Effectiveness of Demonstration-Farm Programs

In evaluating the effectiveness of demonstration farm programs, Bailey cites four factors that contribute to its potency in inducing change: (1) characteristics of the demonstrations, (2) characteristics of the demonstrators, (3) characteristics of the audience, and (4) characteristics of the community or the total social milieu in which the demonstration program is cast.

With reference to characteristics of the demonstrations, Bailey discusses characteristics of individual practices being demonstrated, specific techniques used both in carrying out the demonstrations and in the educational program built around the demonstrations, and the relationship of these two factors on each other. The relationship of characteristics of individual practices to diffusion generally is discussed below. Bailey notes, however, that very little, if any, research has been done on the methodologies employed in demonstration programs. The literature in this area is mainly on how to conduct demonstrations and is "more common sense or subjective than empirical" (Bailey, 1964:18).

Characteristics of the target audience and of the community are also topics that are discussed below, under the topic of factors associated with the diffusion of innovations. The category "characteristics of the demonstrator" takes into consideration such factors as the fact that demonstrators, in contrast to their neighbors, usually rank higher in levels of adoption, leadership roles, use of cosmopolitan sources of new ideas, and various socioeconomic measures.

The writer is aware of no literature, however, that attempts to ascertain whether these characteristics accrue to the demonstrators by virtue of their participation in the program or whether the demonstrators are selected as such because they already possess these characteristics. In his research in Mississippi, Bailey (1964: 18) discovered that when rating each demonstrator on the basis of his influence on the farmers living near him,

> the most effective demonstrators were those who were alike or only slightly better than their neighbors. Those who were markedly higher or lower than their audience usually had a limited impact.

General Diffusion Literature

Rogers (1962:12) identifies four crucial elements in the analysis of the diffusion of innovations: (1) the innovation, (2) its communication from one individual to another, (3) in a social system, (4) over time. The "innovation" can be viewed as an idea, abstract or concrete, and/or a behavioral practice associated with the idea. "Diffusion" is the process by which the innovation spreads. All four of these elements of the diffusion process have been the subject of considerable research. Rogers (1962:4) stated that:

> over 172 different research studies dealing with educational innovations have been completed since 1938. . . . Rural sociologists have completed over 286 diffusion studies since the classic investigation of hybrid corn adoption by Ryan and Gross in 1943.

He, himself, goes on to review 506 diffusion studies in his book, examining six major research traditions in the field of diffusion. There has also been a wealth of literature appearing since Rogers' book.

It would be impossible and impractical to review here all of the literature on diffusion. Therefore, the procedure will be to review the major areas of findings with respect to those factors that are associated with the rate of adoption. Citations will be made in each case to studies which have contributed to that area of understanding. In most instances, the citations are from the field of rural sociology, not necessarily because that is the area of this dissertation, but also--and more particularly--it is the rural sociology research tradition "that has produced the greatest number of publications and studies on the diffusion of new ideas" (Rogers, 1962:31).

Characteristics of the Innovation

It has been observed that some newly introduced ideas have "taken hold like wildfire," so to speak. They have been embraced by nearly everyone within the particular social system to which they are applicable within a relatively short period of time. Other ideas have required one or more generations to receive general acceptance. Still other "new" ideas have never "gotten off the ground" with respect to being accepted generally by the population. Part of this differential in rate of acceptance among innovations

can be explained in terms of the characteristics of the innovations themselves. Numerous studies have examined this relationship (Bertrand, 1951; Coleman, Katz and Menzel, 1957; Fliegel, 1956; Fliegel and Kivlin, 1962a; Fliegel and Kivlin, 1962b; Fliegel and Kivlin, 1966; Graham, 1956; Geiger and Sokol, 1960; Griliches, 1957; Griliches, 1960; Havens and Rogers, 1961; Katz, 1961; Kivlin, 1960; Mansfield, 1961; McCorkle, 1961; Menzel, 1960; Parish, 1954; Prundeanu and Zwerman, 1958; Ryan, 1948; Silverman and Bailey, 1961; Wilkening, Tully and Presser, 1962; Wilkening and Johnson, 1961).

Compatibility. One of the characteristics of a new idea that has been found to affect positively its rate of acceptance is its compatibility to already existing ideas and practices. Is it similar to those things which are now acceptable? Is it consistent with existing "ways" that are evaluated favorably? If the answer to these questions is "yes," the innovation will have a higher acceptance rate than another innovation which is less compatible with the existing cultural structure, all other things being equal.

For example, despite the generally wide acceptance of soil fertility practices employed by modern farmers today, there is still a reluctance on the part of many farmers in isolated, traditional rural areas to use inorganic fertilizers. These farmers perceive fertilizer as "unnatural" compared to manure and believe that its use will poison the soil--as well as the animals and people who consume the products grown in that soil. On the other hand, once the use of inorganic fertilizers is accepted, the acceptance of newly

developed high-analysis fertilizers is relatively rapid, since it is consistent with already practiced procedures.

Santopolo reported the difficulty which Kentucky agricultural agents had in convincing farmers to grow cucumbers instead of tobacco, despite the higher profits to be obtained from the new crop. "Pickle-raising" was perceived by the Kentucky farmers as a feminine enterprise and not socially accepted among their peers, while tobacco-raising is a purely masculine activity (Rogers, 1962: 128).

Simplicity. Another characteristic of an innovation which is related to its rate of acceptance is its simplicity, or complexity. The simpler a new idea is to comprehend, the more readily it is accepted. Ideas, particularly procedures, which are complex and difficult to master are most likely to be by-passed with respect to consideration for acceptance. Fliegel and Kivlin (1962a) report that the complexity of farm innovations was highly related (negatively) to the rate of adoption.

Relative advantage. Most studies in this area agree that the most important factor associated with the innovation itself is that of the perceived relative advantage which a new idea has over presently accepted ways and/or other available alternative innovations. Relative advantage is most often measured in terms of cost, which may be associated with eventual economic profitability, or, more subtly, in terms of labor input or convenience, or even comfort. Fliegel and Kivlin (1962a) found the latter factors (convenience and comfort) to

be relatively more decisive in the decision to adopt than economic cost.

Communicability. Some ideas are easily observed and readily comprehended in the observation. Or, they can be inter-communicated among individuals with relative ease. Passively or actively, then, some innovations can be communicated easily in contrast to other innovations. As might be expected, those ideas which are more easily communicated diffuse more rapidly among potential adopters.

Although this matter of communicability is related somewhat to the "complexity-simplicity" factor, it involves another dimension of which visibility is a major attribute. For example, two agricultural practices of relatively equal complexity are introduced into a geographical area. One is a field practice, the other a management practice. Farmers passing by the fields of early adopters can "see the difference," and in observing can possibly "read" a great deal of information about the field practice. Management innovations, however, particularly those involving decision-making, are highly invisible to other farmers. It is also true that some practices or procedures are easily described verbally to others, and hence more communicable. This is especially true of motor skill patterns involving material items. Both Ogburn (1922) and Linton (1936) noted early that material innovations diffused and were adopted more readily than non-material ideas.

Divisibility. This is the degree to which an innovation can be tried on a limited basis. Studies show that practices which can be broken down into parts, or attempted on a small scale basis, are generally accepted at a more rapid rate than practices which do not have this attribute. Aside from the differential in cost, a farmer will be more likely to try a new strain of seed which he can plant on a few acres in a small scale trial than he will be to install a new milking system, which is an "all-or-nothing-at-all" sort of change. The evidence also indicates that this characteristic is more important with early adopters than with later adopters. This is logical, since ideas are relatively well established and "proven" by the time later adopters usually consider them.

These are not the only characteristics of innovations which have an influence on the rate of adoption. They are, however, those which are generally agreed upon by a majority of the studies to be salient. It is to be recognized also that their several effects are neither single nor unidimensional, but there is interaction among them, as well as between characteristics of the innovation and other factors associated with adoption or acceptance in the diffusion process.

Characteristics of the Potential Adopter

It is rather apparent that not all persons accept an innovation or new idea at the same time. (Otherwise there would be no justification for "diffusion" studies!) Some individuals seem

willing to try a new idea the moment they first hear of it; others seem never willing to try a new idea. The majority of people lie somewhere in between these two extreme positions. One of the most researched areas of the diffusion-adoption process is that of the characteristics of the potential adopter (Beal and Rogers, 1960; Beal, Rogers, and Bohlen, 1957; Belcher, 1958; Blackmore, Dimit, and Baum, 1955; Bowers, 1938; Bylund, 1962; Bylund, 1963; Cancian, 1967; Cohen, 1962; Copp, 1956; Copp, 1958; Coughenour, 1960; Dean, Aurbach, and Marsh, 1958; Dodd, 1953; Eisenstadt, 1953; Emery, Oeser, and Tully, 1958; Fliegel, 1957; Fliegel, 1959; Fliegel, 1960; Fliegel, 1965; Fliegel, 1966b; Goldstein and Eichhorn, 1961; Griliches, 1957; Gross, 1949; Gross and Taves, 1952; Hägerstrand, 1953; Harp, 1960; Hess and Miller, 1954; Hildebrand and Partenheimer, 1958; Hoffer, 1942; Hoffer and Stangland, 1958a; Hoffer and Stangland, 1958b; Jones, 1963a; Junghare and Roy, 1963; Kreitlow and Duncan, 1956; Larsen, 1962; Lindstrom, 1958; Lionberger, 1949; Lionberger, 1955; Lionberger, 1959; Lionberger, 1963b; Lionberger and Coughenour, 1957; Mansfield, 1961; Marsh and Coleman, 1955a; Marsh and Coleman, 1955b; Mueller, 1958; North Central Rural Sociology Subcommittee, 1955; Rogers, 1956; Rogers, 1957; Rogers, 1961; Rogers and Burdge, 1961; Rogers and Leuthold, 1962; Ryan and Gross, 1943; Sheppard, 1960; Wilkening, Tully, and Presser, 1962).

Several students of innovation and diffusion have attempted to determine identifiable stages in the diffusion process within an individual. A committee of rural sociologists, after surveying the

findings of diffusion studies conducted within their field, advanced a theorized process of diffusion which indicated five stages through which an individual proceeds from the time he first learns of a new idea until he eventually accepts (or rejects) it: (1) awareness, (2) interest, (3) evaluation, (4) trial, and (5) adoption (or rejection) (Rogers, 1956; and Rogers, 1962:148-192). Obviously, these are not discrete, or distinctly separate stages in the individual's adoption process. Nor do all people follow these five steps in every decision they make regarding new ideas. Categorizing the stages this way is merely a heuristic device which describes a relatively continuous sequence of mental events. Beal and Bohlen (1957) report that farm operators and their wives are able to recognize these five stages in the process of their own decision making, however, when questioned about them.

To the knowledge of the writer, no studies have attempted to ascertain whether early adopters are merely individuals who move through the five stages enumerated above more rapidly than late adopters, or whether they are persons who more quickly become aware of new ideas, and, therefore, enter the initial stages of the process sooner. From the empirical evidence, one could make an argument for either case, or for a combination of both.

Numerous studies have focused on identifying various factors related to innovativeness. In some instances, these studies have attempted to control for adopter categories; many others have

not. Several of the more important characteristics associated with innovative behavior are enumerated below.

Age. Although there is not universal agreement among the research findings, the majority of studies report that age is inversely related to innovativeness. Earlier adopters are younger than late adopters. As Rogers (1962:174) points out, there are adequate theoretical grounds for expecting the younger members of a social system to be quicker to accept new ideas.

> The socialization of personality occurs mainly in very early life. In a rapidly changing culture, this means that younger people learn a more modern set of cultural values than do older people, who were socialized in an earlier era. The young are less conditioned by the older culture; hence, they are more innovative.

Education. Earlier adopters have more years of formal education than late adopters. Although most studies measure this dimension by examining the relationship between innovativeness and the number of years of schooling, it is questionable whether the actual factor involved is education, per se, or a level of mentality concomitant with measurable levels of education. Certainly, education increases knowledge. But the critical relationship here may be that education creates an appreciation for, or a favorable attitude toward, new knowledge or new ideas. On the other hand, depending on the content of the learning, education may, or may not, "condition" an individual to accept change more readily. Another factor underlying the relationship between education and innovativeness may be that those farmers (or other practitioners) who have educational

experience are more likely to be able to adapt a new idea to their own situation before there is generally very much information available about the innovation. It is also true that education is highly correlated with other factors which are logically more directly related to adoption behavior, such as income, age, or accessibility to more direct sources of specialized and technical information. At best then, education seems to be an important but indirectly related variable to innovativeness.

Financial resources. Early adopters are characterized by higher incomes, greater available financial resources (whether actual capital or credit), and larger-scaled operations. It would seem quite logical that those individuals with a more favorable financial situation would be in a better position to assume the risk that is associated with the acceptance of any new idea. It is also a fact, however, that the converse is also true, that individuals who are willing to assume the risk and accept new ideas may thereby elevate themselves into a more favorable financial position comparatively more rapidly because they take advantage of early greater profits. Whatever the direction of the relationship, wealth and innovativeness seem to be highly correlated.

Competency. Early adopters display greater competence in their several endeavors than do later adopters. Competent practitioners are more likely to be "up" on their field; therefore, they would be more likely to learn about new ideas than less competent persons. Closely related to this is specialization. More competent

farmers, for example, are more likely to be specialists, concentrating on one farm enterprise. Specialization and innovativeness are highly correlated in many studies.

Social status. Many research studies indicate that earlier adopters have higher social status or community prestige than do late adopters. Several studies have indicated that social class values attached to the idea or innovation may affect this relationship. For example, Graham (1956) found canasta was adopted by the upper class more readily, but television was accepted more readily by the lower classes. Cancian (1967) also suggests that this relationship between innovativeness and social class may be curvilinear, that as an individual achieves greater status he reaches a point at which his innovative tendencies level off. When he occupies a low position on the social status scale he has little to lose, in the way of status, by being an innovator. As success accrues to his efforts, he continues innovative behavior. But when he reaches a certain level of achieved status, he begins to hesitate about plunging into new ventures. He is unwilling to risk his reputation as a successful person on a loser!

Social participation. Early adopters are characterized by higher levels of both formal and informal social participation than later adopters. This includes participation in community activities such as church socials, sports events, and recreational activity, as well as being active members of socially and economically oriented

organizations. They also demonstrate more leadership responsibility than do later adopters.

Communicative behavior. Early adopters generally exhibit greater accessibility to more direct sources of information than do later adopters. Although they use personal sources of information from time to time, early adopters appear to place more confidence in impersonal sources. Within agriculture, early adopting farmers read more farm magazines, consult more often with the county agent or university subject-matter specialists, are more familiar with specialized technical publications, and attend more educational meetings than do later adopters. Therefore, they utilize a greater number of different information sources. They also interact more frequently with other farmers and are named more often by other farmers as personal sources of information and advice than is true of their less innovative brethren.

Cosmopoliteness. Rogers (1962:182-183) defines "cosmopoliteness" as "the degree to which an individual's orientation is external to a particular social system." Early adopters have been found to be much more cosmopolite than later adopters. As stated above, earlier adopters use more cosmopolite information sources than later adopters. They travel much more widely and are interested in affairs beyond the confines of their own social system. Their reference groups are often outside their own social system rather than within it. As Tarde (1895:87-88) observed,

> To innovate, to discover, to awake for an instant from his dream of home and country,

> the individual must escape, for the time being, from his social surroundings.

As in the case of characteristics of the innovation, we have reviewed only those generalizations about characteristics of the potential adopter which most research studies in the area generally agree are associated with quickness to accept a new idea. Again, these variables do not operate independently, either among themselves or among other groups of factors, such as characteristics of the innovation or characteristics of the social milieu, which is discussed in the section following. There is a high level of interrelationship among several of the variables, and it would appear that there is some interaction among several others.

Characteristics of the Social Milieu

"No man is an island," as many sages have observed. Individuals are members of social groups, and together they reside in a natural and social environment. Behavior is a function not merely of one's own desires, needs, attitudes, and characteristic attributes, but also of the expectations, influences, and limiting characteristics of the environment, particularly that of the social milieu. Many studies have examined the influence of cultural and social factors on the diffusion of new ideas (Allers-Montalvo, 1957; Beal and Bohlen, 1957; Bose, 1962; Chaparro, 1955; Coleman, Katz, and Menzel, 1957; Copp, 1956; Emery, Oeser and Tully, 1958; Fliegel, 1962; Hoffer, 1942; Hoffer, 1944; Hoffer and Gibson, 1941; Hoffer and Stangland, 1958a; Lionberger, 1951; Lionberger, 1954; Lionberger, 1963a; Lionberger and Hassinger, 1954; Marsh and Coleman, 1954a;

Marsh and Coleman, 1954b; Marsh and Coleman, 1954c; Menzel and Katz, 1955-56; Merton, 1949; Nielson, 1967; Nye, 1952; Pederson, 1951; Ramsey, Polson and Spencer, 1959; Rogers and Beal, 1958; Rogers and Capener, 1960; Sheppard, 1963; van den Ban, 1960; Wilkening, 1952b; Wilkening, 1956; Wilkening, 1958b; Wilkening, Tully and Presser, 1962).

The kind of farming a farmer engages in is a result not only of his own knowledge and customary ways, or of accessible channels of information, but also of the interest, expectations, and attitudes of various individuals and groups in the community. These can be expressed formally in the form of laws or regulations (such as milk sanitation codes) or informally in the form of folkways and mores, or interpersonal expectations. The differential rate of adoption among communities or geographical areas can be explained in part by these limiting factors or conditions which are characteristic of the community or social milieu.

Community values and norms. Values are the organizing themes in the thinking and behavior of individuals within groups. Norms are the standards by which individuals know and judge how things should be, and be done, properly. Therefore, values are the underlying factor of norms, attitudes, and behavior. Linton (1952:74) states:

> If we know what a society's culture is, including its particular system of values and attitudes, we can predict with a fairly high degree of probability whether the bulk of its members will welcome or resist a particular innovation.

Naturally, it depends on how sensitive a person is to these community pressures toward conformity. There is a differential awareness among individuals of the strength of various values and norms. Research studies have shown that where the values and norms of a community are oriented toward the conservation of traditional culture, i.e. stabilizing the status quo, the acceptance of new ideas is considerably slower than in a community which is oriented toward change and modernization, i.e. progressive. Pederson (1951) examined the difference in the rate of adoption of new ideas between Polish and Danish farmers in Wisconsin. The culture of the Polish farmers was oriented toward preservation of the traditional status quo, while that of the Danish farmers was oriented toward change and modernization.

Those individuals who identify themselves with values of efficiency and self-reliance are much more likely to accept new ideas that increase efficiency than those persons who identify themselves with values of security and conservatism.

Social isolation. The diffusion of an idea or practice implies communication. Therefore, it would seem logical that those people who are isolated from communicative contact with others would be far less affected by this necessary condition for acceptance of change. Studies have shown that, in truth, individuals who are relatively not accessible to media carrying new ideas--e.g., newspapers, radio, T.V., specialized technical information sources, even other people--are, in fact, resistant to change. The rate of change

among non-isolated individuals seems to be indeed higher, whether one considers geographical or social isolation.

Some rural communities are remote or "out-of-the-way," and as a result are detached from many of the ongoing social processes of the larger society--particularly communication. People in these places may have only one T.V. channel, if any, may not be served by a daily paper, and may live so distant from neighbors that communication with them exists at a minimal level. On the other hand, individuals who are not geographically isolated may be isolated socially. By their own choice they may not make themselves accessible to available communication channels, or they may lack the necessary skills (psychological or social) involved. In any event, where people have very little contact with the world around them, their lives remain much the same, despite the changes which may be going on around them. The literature shows that exposure to varied sources of new ideas is associated with change--and the rate of change is somewhat a function of the number of different kinds of contacts.

Presence of special functionaries. In interpersonal communication, facts are seldom exchanged without commentary of advice and opinion. In some instances, the new ideas and the accompanying opinions are freely offered without solicitation; in others, it is sought. Not everyone's knowledge and opinions are sought after, or accepted at face value. Some persons may occupy socially institutionalized roles in the communication process with

respect to ideas and the advisements attached to them. The presence of these special functionaries will greatly facilitate, or hinder, as the case may be, the diffusion process.

Innovators and very early adopters are one such type of functionary. They serve to introduce new ideas into the community. Although local farmers may be aware of a particular agricultural practice, for example, they may never have really thought of it in terms of local applicability. The local "innovator" tries it out. His peers are now aware of the new idea at a different level of consciousness than they had been before. The existence of the new idea has assumed a reality which did not exist before. For some members of the community the innovator is also a source of information, but, for the most part, he is considered a deviant and is not influential in their decision-making process. Certainly they will evaluate his performance in the matter, but his primary function is that of introduction locally.

Another special functionary is the key communicator or opinion leader. (A variety of terms are used by different investigators to refer to this role.) Key communicators are generally operationally defined in the literature as individuals who are mentioned frequently as personal sources of information, primarily specialized information. They seem to be more involved in the communication of ideas and information than other persons. They are characteristically more active in seeking new ideas and make more use of all information sources than do other individuals. In

most other characteristics, however, they are quite similar to their peers, although generally they enjoy higher prestige. Evidently, because they are "in the know" and, at the same time, do not depart from locally accepted standards, they are sought after for information and advice. The important factor is that as communicators of information they are in a position to selectively edit what they transmit.

Influentials are individuals who exert a determining influence on the decisions of other persons. In some cases, key communicators and influentials are the same persons, but not always. Influentials do more than communicate ideas and give advice. By approving (or disapproving) of a new idea they legitimize the adoption or rejection. Therefore, they are individuals whose opinion is respected and are viewed as being capable of determining whether a new idea is applicable locally or not. Lionberger (1960:63) reports that when influentials adopt a new practice, "the adoption curve takes a characteristic sharp turn upward," because then most people regard it as acceptable and will adopt it.

In communities which are characterized by rapid technological change, higher levels of education, more progressive views toward innovation and efficiency, it is possible that all three of these specialized roles will be played by the same persons. However, where a premium is placed on maintaining the status quo, innovators will hardly be looked upon as legitimate sources of information or advice, neither will their opinions be influential in changing the ideas or ways of others.

The presence or absence of these special functionaries within a system can affect the diffusion of new ideas. This is not to say that other persons can not or do not perform these functions. They do, to a certain extent. But for the community in general, or for a reasonably large segment of it, particular persons come to fill particular roles.

Memberships in groups. The other people with whom an individual associates exert an influence on his thinking and behavior. This is especially true of those persons with whom he has frequent, regular contact, such as fellow members of the groups to which he belongs. These groups may be informal groupings such as neighborhoods, locality groups and cliques, or they may be formal associations such as co-ops, churches, or political organizations. In each case, these functioning social groups establish norms which serve as standards and guiding principles for those in the group. In some instances, such as locality groups, for example, these norms may apply directly to the agricultural activities of farmers; in other instances, it may merely be that the other persons in the group exert pressure upon the individual to adhere to opinions or ways that are not necessarily salient to the group, but because the individual values his relationship to the group, he accepts the expectations of other group members for him.

The power of group influence in the acceptance of new ideas was reported by Siamotowe and Musonda (1968). Zambian agricultural agents were attempting to induce farmers in remote areas of that

country to raise higher grade beef cattle, the animals produced by the native farmers were "scrubs," and large herds were needed to meet family demands and provide farm income. Attempts to introduce higher grade beef cattle were met with considerable resistance, however, because prestige in the community accrued from the number of cattle killed by a host for a wedding feast or other festive occasion, not on the quality of meat or other factors. The Zambian farmers' friends and peers would ridicule the festivals hosted by the early adopters of high grade cattle, because it required only three or four head of cattle to feed the guests, whereas non-adopters "splurged" literally dozens of cattle to supply their feasts.

Programs of planned change. Another important factor of the social milieu influencing the rate of diffusion is the presence (or absence) of programs of managed or planned change. Change agents seek to induce the acceptance of new ideas, usually with the view of achieving definitive goals and objectives within the social system of their target audiences. Agricultural extension workers actively seek to educate the agricultural population of a particular area, and to introduce new ideas that will increase efficiency of farm operations and at the same time improve the farmers' standard of living. Teachers attempt to infuse new knowledge and skills into the minds and lives of their students. Not all change agents, however, represent public agencies. Many are affiliated with special interest groups or commercial enterprises. Many industrial enterprises employ market research staffs to better advise their promotional

agents how to improve the diffusion of their products among potential consumers.

Almost all of the research in this area indicates that programs of planned or managed change do play an important role in securing the adoption of new ideas. How effective such programs are, of course, depends on many factors, not the least being characteristics of the program itself.

Summary

An attempt has been made to review what is now known about the effectiveness of result demonstrations in diffusing new ideas--particularly recommended farm practices. Although the literature about demonstrations is extensive, most of it is descriptive and is concerned with changes wrought among the participators (demonstrators) in the program. Much of the evidence on the impact of demonstration programs on the surrounding farms is characterized by less rigorous and precise methodology.

Much more is known about the diffusion process generally. Research has demonstrated that the speed with which new ideas spread is a function of (1) characteristics of the innovation itself, (2) characteristics of the potential adopters, and (3) characteristics of the social milieu within which the communication about the innovation takes place. The process of diffusion, then, is a complex process. It is not certain--although often assumed--that the factors which are associated with the diffusion process, as such, are

applicable to the particular situation of the demonstration farm. However, an understanding of the interplay of the elements in this complex whole is necessary to perceive the role which an educational technique such as the demonstration farm can play.

CHAPTER III

METHODOLOGICAL AND THEORETICAL ORIENTATIONS

The Focus of Evaluative Research

This dissertation is evaluative research. According to Suchman (1967:37), the identifying feature of evaluative research is that it focuses on the goal(s) or objective(s) of the program or project being evaluated. Its purpose, then, is to measure the extent to which the goal(s) or objective(s) has been attained.

The focal point of basic research is the hypothesis. Cohen and Nagel imply that basic research begins with the formulation of an hypothesis, whatever steps or stages are necessary preludes to that formulation (Selltiz, 1963:35). The hypothesis is an assertation or a statement of a relationship between two (or more) variables. One (or more) of these variables is called the independent variable, or the "cause." The other variable is the dependent variable, or the "effect." The function of the hypothesis is to state the relationship between these variables explicitly, so that this relationship may be tested. Accordingly, the hypothesis directs the research; for the investigation then proceeds to verify whether or not this presumed or declared relationship is descriptive of reality. Operationally, this is accomplished by examining changes or variations in the dependent variable, and ascertaining whether they are concomitant with changes or variations in the independent variable(s).

Evaluative research also examines change. It begins with a statement of the "hypothesized" relationship between some programmed activity (the independent variable) and that activity's desired or proposed impact or effect (the dependent variable). The expression of this hypothesized relationship is formulated, in effect, in the stated goals or objectives of the action or educational program which is the object of the research. Therefore, the hypotheses of evaluative research are "ready-made," so to speak. If, for example, the goal of an educational-action program such as the one under study is to induce the use of a particular herbicide, as opposed to numerous other more commonly utilized herbicides, the hypothesis is, in effect: adoption of "Herbicide X" is related positively to exposure to the educational program. For the purposes of the research, the null hypothesis would be: exposure to the educational program has no effect on the adoption of "Herbicide X."

It is true, however, that the leaders or administrators of action and educational programs often do not define the goals and objectives of their programs. Persons involved in action programs are often more concerned with "doing things" than with defining precisely what it is they are attempting to accomplish (Raudabaugh, 1967). Therefore, objectives are frequently stated inadequately as being the "things to be done," or activities which the program participants will engage in. Another frequent practice is to state objectives as being the general "content" areas that will be dealt with in the program. Again, this is inadequate, and really evades

the issue of specifying definitive goals or objectives which the program activities will attempt to effect.

In light of these circumstances, one of the primary tasks of the investigator in evaluative research is to define clearly what the program objectives are. This is not necessarily an easy task. Hyman, Wright, and Hopkins (1962:7) state:

> The many difficulties suggested--the breadth of the thing subsumed under a particular objective, the multiple objectives encompassed by many programs, the ambiguity inherent in any or all of the objectives--are characteristic of many programs and are enough to stagger the imagination of the evaluator.

Therefore, one of the methodological focuses of this dissertation will be the primary objectives of the educational program built around the result-demonstrations supervised by the extension staff of Indiana and Susquehanna counties. Since these objectives cannot be formulated or even assumed a priori by the investigators, the initial task of the research will be the identification of the objectives of the educational program.

Theoretical Orientation

Although this is evaluative research, there is an underlying theoretical orientation which will provide the basis for the analysis and interpretation of the findings of the study. The orientation here is that of communications theory. There have been three principal traditions in communications theory: (1) linguistic anthropological, (2) social-psychological, and (3) mathematical.

As the name implies, linguistic communication theory is primarily concerned with the analysis of lingual signals, particularly verbal signals. With respect to the area of the diffusion of agricultural practices, very little, if anything, has been done within this approach. Perhaps this might represent a fruitful area of research concern and open another dimension of understanding in the diffusion process.

On the other hand, most of the research done in the area of adoption and diffusion has been within the social-psychological tradition. Few, if any, of the studies ever state this, but the approach is that of the social-psychological tradition as it is defined by communication theorists.[1] One of the classical statements in this tradition is Newcomb's (1953) concept of co-orientation as the basis of communication:

> Every communicative act is viewed as a transmission of information, consisting of discriminative stimuli, from a source to a recipient. . . . Thus in the simplest possible communicative act one person (A) transmits information to another person (B) about something (X). Such an act is symbolized here as AtoBreX.[2]

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[1]For a discussion of the three major traditions in communication theory and the role they have each played in research, see Smith (1966:1-10, 13-14, 64-65, 119-120).

[2]For a more complete statement of Newcomb's theory, see Newcomb (1950). For an extension of Newcomb's model to include such concepts as roles, coding, channels, and feedback, and which is oriented toward the social-psychological aspects of mass media communication, see Westley and Mackan (1957).

Viewing the farm practice adoption-diffusion process within this framework, we see, for example, the county agent or another "more-informed" farmer, A, communicating information to a potential adopter, B, about a particular recommended farm practice, X (see Figure 1). The orientations that exist between the actors and between each actor and the subject of their communication contribute to the symmetry or asymmetry of the system. If the system is asymmetrical, there is tension created toward establishing symmetry. Communicative acts, then, may be the initiators, or the results, of changes in the orientations that exist in the system and these changes may be actual or anticipated. The relationship of the majority of adoption-diffusion research to the social-psychological model is that characteristics of the innovation, characteristics of the potential adopter, and characteristics of the social milieu all impinge upon the orientations existing between the elements of the systems.

For example, in a community where progressiveness and efficiency are highly valued, a potential adopter would likely have a positive orientation toward an "early adopter" who recommends a new practice to him. The fact that the early adopter has a strong positive orientation toward the practice produces an asymmetrical situation, since the potential adopter, to this point in time, has had a negative attitude toward the practice, manifested by non-adoption behavior. However, now there is tension to achieve symmetry. This can be accomplished in three ways: (1) the potential adopter can misinterpret the early adopter's orientation toward the new

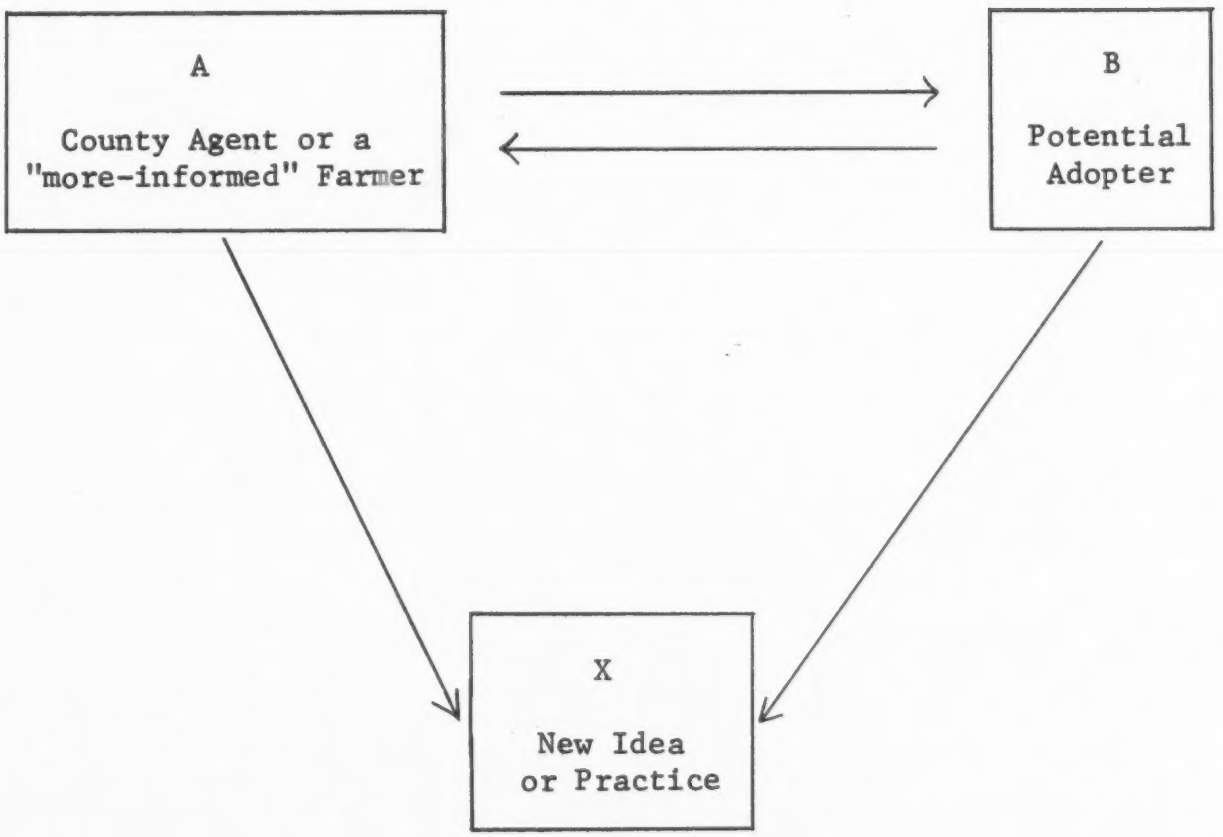

Figure 1. Representation of Newcomb's AtoBreX model of Communication. The system has a tendency to "prefer" symmetry, which results when there is a "balance" or "symmetry" among the co-orientations (represented by arrows) existing between the elements of the system.

practice as being negative; (2) the potential adopter can change his orientation toward the early adopter, i.e. view him negatively; (3) the potential adopter can change his orientation toward the practice and adopt it. For example, having viewed the practice negatively because of its high initial cost, the potential adopter might now change his view to a positive orientation because of its labor-saving or convenience characteristics.

It is to be recognized that this particular AtoBreX system is only one isolated system in operation at any one moment, and that to understand completely the changes which do occur, one must need consider a large number of simultaneously operating systems, some of which involve one or two of the same elements in combination with other elements.

The Mathematical Model

The general statement and model of the mathematical theory of the communication process was developed in 1947 by Claude Shannon and was presented by Shannon and Weaver (1949). Shannon and Weaver did not have interpersonal communication in mind when they published their model, being concerned only with the technical problem of electronic communication. However, its usefulness in analyzing human communication networks was quickly recognized, and it has since been employed widely by behavioral scientists (Berlo, 1960:23-39; Andersen, 1968; McDonough, 1963:32-49; Redfield, 1958:3-14).

The fundamental elements of Shannon's communication system are represented graphically in Figure 2. The information source

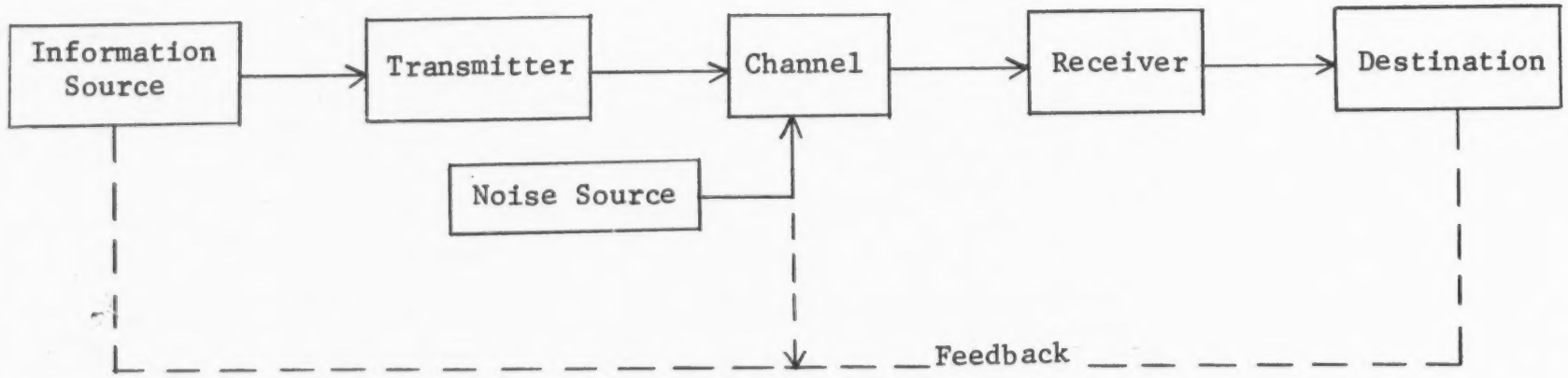

Figure 2. Symbolic representation of the fundamental elements in Shannon and Weaver's communication theory model. The information source selects a desired message from the population of possible messages. The transmitter encodes signals which are sent through the communication channel to the receiver. The receiver decodes the signals by assigning meaning to them for the destination. Noise (distortions, errors, "static," deletions, additions) is most often associated with the transmission of the signal through the channel. Semantic noise, however, may enter the system at either the transmitter or receiver.

selects the message it desires from the set of all possible messages. The message is encoded into signals by the transmitter and sent through the communication channel to the receiver. The receiver acts as an inverse transmitter, decoding the signals of the message and relays the meaning of the message to the destination.

Using the example of an Extension educational program, the county agricultural agent may be the information source. He selects, from all the sets of possible messages, that one message which he believes will impart the information he desires to convey to the farmers in his county. He formulates this message into signs and signals which he anticipates his audience will be able to understand, i.e., attach those meanings to the signals which will adequately and accurately convey what he has in mind. He selects a channel through which to send these signals, e.g., newspaper article, radio program, twilight meeting. The farmers who receive the signals interpret them according to their capabilities and background experience, and assign a meaning which is, in effect, the message they perceive.

Several observations should be made at this point. First, the process explicated by this model is occurring at several levels simultaneously. For example, one might say that the source of agricultural information is the Agricultural College of the Land Grant University, and the destination is, essentially, the total population of farmers within the State. At this level, county agricultural Extension agents, along with the University subject-matter specialists

and all other functionaires within the State Cooperative Extension Service bureaucracy, taken together, represent a rather complicated complex of sub-channels through which communicative messages are sent. The model is equally useful, whether analyzing communication networks on a gross level involving complicated systems, or on an interpersonal level, or at some intermediary level in between.

Another fact to consider is that, although for analytical purposes one views communication as a series of discrete entities consisting of a message being conveyed from a source to a destination, communication is a process, and, therefore, dynamic in nature. And, as is recognized in the concept of feedback, communication in process hardly ever occurs in one direction only. So that the county agricultural extension agent--or, if one desires to conceptualize the process at a macro-level, the state extension service--is involved in a continuous series of communicative acts, channeling a multiplicity of messages in the direction of the target audiences, and simultaneously perceiving those cues or other messages fed back by the target audiences which inform him of how his original messages have been received.

The Demonstration Farms in the Context of the Model

This thesis focuses on that part of the communication system which is directed through the channel of the result-demonstration program, which includes the demonstration farms and the education program built around them. It is obvious that communication between

the Agricultural College and the farmers of the state is multifarious, even with respect to that which travels through the Cooperative Extension Service. When one considers those messages that reach the farmer indirectly via commercial and other specialized communicators, the complexity of such a network is apparent. The farmer today is exposed to a multitude of stimuli in the form of agricultural information. Our attention, however, shall be focused on the transmission of stimuli through the particular system of the educational program built around the extension result-demonstration project in Indiana and Susquehanna Counties. This is illustrated in Figure 3.

Resolving the focus still further, it is recognized that within this model there are problems at three levels. Weaver (1949: 11) identifies these levels as (1) technical problems, which are "concerned with the accuracy of the transference of information from sender to receiver"; (2) semantic problems, which are "concerned with the intended meaning of the sender"; and (3) the problems of influence or effectiveness, which are "concerned with the success with which the meaning conveyed to the receiver leads to the desired conduct on his part."

Certainly this latter level, that of the problems of impact or effectiveness, is one of the important levels of concern for those who are involved in the process.

One might be inclined to assume that the concern of communication theory would encompass only the transferal of a message from its inception at the source to its reception at the destination, and

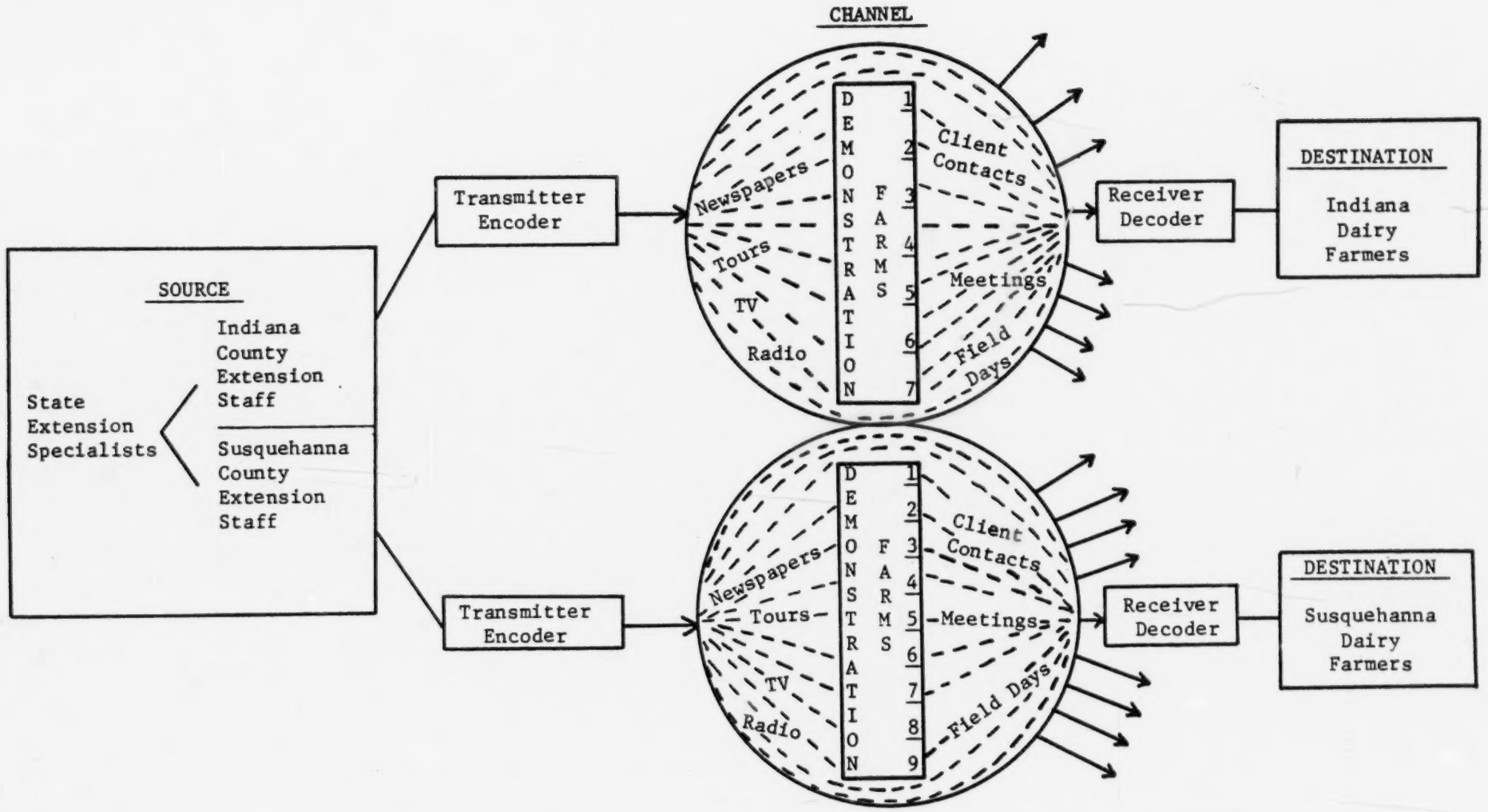

Figure 3. Model of the communication system under study. The channel is multifarious, in that it includes not only the demonstration farm, but also the demonstrator, meetings held on and off the farm, newspaper articles, radio and television programs, etc.

there be done with it. But this is not so. Just as the initiation of the communication has its genesis in the population of messages from which a given source can choose any particular message to be processed through the system, the terminus of the communicative act is not in the perception of the message by the destination, but rather in the response which is selected from all possible responses which constitute the reaction to the message.

The relationship of the response to the other integral parts of the communication whole can be illustrated best, perhaps, within the body. Suppose a person wills to pick up an object from a table. The central nervous system selects a particular message from the thousands of possible messages and sends it along the nervous system into the muscles. The muscles then react in a particular way--in a sense, one might say that the muscles select one reaction from a possible many. If the muscles do not respond with motions that pick up the pencil, then, in effect, the system has broken down somewhere--the communicative act has not been completed.

A similar example would be that of the electronic computer. Experts in electronic communication are concerned not only with the technical engineering details of an electronic circuit design that will convey electric impulses from one location to another within the computer. But they are concerned that the proper sequences of impulses which make up a message, when they arrive at the designated location, effect the correct operation. Otherwise, the elaborate circuitry design with all its components is useless, no matter how intricate or exquisite it may be.

It is necessary, therefore, to consider the response of those who perceive communication messages in the light of the purpose of those who initiate the messages, if one is to evaluate the effectiveness or impact. This is really not a new notion. Aristotle defined the study of rhetoric as the search for "all the available means of persuasion" (Roberts, 1946:6). Even he was so bold as to imply that the primary object or purpose of communication is persuasion, and there are very few who have convincingly argued him wrong, that one can communicate at all without some attempt to persuade, in one way or another.

The avowed basic purpose of the Cooperative Extension Service is to change the relationship which exists between its target clientele and the environment in which that clientele operates. More specifically, it attempts to educate individuals to utilize to their greatest advantage the knowledge and techniques uncovered and developed through scientific research within the land-grant university system.

If communication has in fact occurred, then the message which has originated with the extension agent impinges on the target clientele and the latter makes a discriminatory response. If the message is not perceived or is ignored by the purposed "receiver," there has been no communication, or that communication which did occur is not that which was intended. The test is a differential reaction of some sort.

In the case of electronic communication, such as that which occurs within the computer, the internal programming of the

computer predetermines what the discriminatory response will be to any particular message or combination of messages. Obviously this is not true when the human organism occupies the terminal position in a communicative act. There is a broad expanse of possible responses, some of which never generate beyond the mental process stage while others may spill over into the behavioral realm.

With this orientation, then, the central concern of this thesis is in the response obtained by the demonstration farm program among the target clientele. The goals or objectives of the program, once ascertained, will indicate what responses the communication source had in mind as it initiated and transmitted the singular messages which constituted the communication of the total educational program. The impact of the program, in terms of the adoption of farm practices, is, in essence, the extent to which the communication act has preceded the desired responses.

CHAPTER IV

COLLECTION OF DATA

The preliminary stages of the "action" or educational program were initiated in the autumn of 1961. At that time the 18 demonstrators, nine in each of Indiana and Susquehanna counties, were chosen. The county extension staffs, together with the university extension specialists, evaluated the demonstrators' situations, and samples were taken from all of the demonstrators' fields which were included in the program, and on the basis of soil analysis tests, fertilizer for the 1962 harvest season was ordered. General plans were laid for the cooperation of the participants involved in the program. Implementation of the program, however, did not begin until the spring of 1962, when TVA fertilizer was first applied by the demonstrators. The public was given no general knowledge of the program until midsummer of 1962.

Determination of Educational Program

Before one can analyze or evaluate the impact of an educational or action program, it is necessary to determine what the program is and what its objectives--or intended results--are. Accordingly, the initial activities of the investigators was to interview all of the principal administrators of the program. Meetings were held separately with university extension specialist staffs in the departments of farm management, agronomy, dairy science, and agricultural engineering. Information was obtained from each of these

sources on the present levels of agricultural technology in that field within the geographical areas of the two counties, on changes which were foreseen on the basis of continuing present trends, and on that department's projected input in the educational program with respect to time, effort, and subject matter content emphases. The county staffs were also interviewed to determine their perceptions of the same information asked of the specialists.

Throughout the five-year period of the educational program, the investigators attempted to keep abreast of the specialist's activities with respect to the demonstration program. The writer accompanied the farm management and agronomy specialists on their regular semi-annual meetings with the demonstration farmers. He also accompanied them on some of the special trips which they made into the two counties or to particular demonstration farms.

At the end of the five-year program, the specialists and county extension personnel were each "debriefed" by the investigators. The program was reviewed in detail, with considerable attention being paid to changes and adjustments that were made in the administration of the program which deviated from the design projected at the outset. Opinions were also solicited in the form of evaluations of various aspects of the program.

Data were also gathered from the demonstration farmers during the five-year period. Early in 1962, information was obtained about their levels of general agricultural technology, management skills, farm practice adoption, participation in formal and informal

social activities, interpersonal visiting and communication network patterns, as well as their attitudes, goals, and values. Comparable data were obtained at the conclusion of the program. In addition, each demonstrator was interviewed semi-annually to assess the changes taking place in his farming operation, to determine his perceptions of his role as a demonstrator, and to obtain his evaluation both of the input of the educational program being channeled through his farm and of its effectiveness in disseminating ideas and practices to neighboring farmers.

Other Farmers' Contacts with Demonstrators

An attempt was made also to obtain a sample of the contacts other farmers made with the demonstration farmers. This was an effort to trace possible channels of interpersonal communication, particularly with respect to ideas and practices introduced on the demonstration farms, as well as to determine what subject matter areas were included in the content of demonstrators' conversations with other farmers. The investigators provided the Susquehanna demonstration farmers with pads of pocket-sized (3 x 5 inch) "contact slips" which could be filled out hurriedly and which contained a minimum of information about a daily interpersonal contact: who are the persons contacted, which party initiated the contact, when and where it took place, and the main topics of discussion (see Figure 4). Although cooperation on the part of the demonstrators was less than enthusiastic in this

DEMONSTRATOR'S CONVERSATION

Demonstrator's Initials: .....

Date: ..... 196.....

WITH WHOM? Name(s) — Farmer (F) or Non-farmer (NF) (Circle one)

1. ..... F NF
2. ..... F NF
3. ..... F NF

If non-farmer, give business or occupation 1. ..... 2. ..... 3. .....

If more than three, how many more?.....

WHERE CONVERSATION TOOK PLACE?

☐ On your farm ☐ On another farm
☐ Some other place (Identify, such as church, grocery store, feed mill, barbershop, etc.): .....

WHO BEGAN CONVERSATION?

☐ Yourself ☐ Other person(s)

SUBJECTS OR TOPICS (Check all topics covered; circle main one):

☐ Farm management
☐ Fertilizer or lime
☐ Hay or forage crops
☐ Silage
☐ Grain crops
☐ Pasture
☐ Weed control
☐ Dairy herd management
☐ Feeding
☐ Machinery or equipment
☐ Farm buildings
☐ Prices or markets
☐ Record-keeping
☐ House or homestead
☐ Check plots

☐ Other (specify): .....

Figure 4. Contact slip which was provided for the demonstrators to record conversations which they had with other persons about the demonstration farm program.

endeavor, a sampling of contacts was obtained for a two-year period. Although only two demonstrators continued to fill out any of these slips on their own initiative after the initial trial, the writer visited with each demonstration farmer on a quarterly basis during the two-year period and completed slips for interactions which they recalled having occurred during the period previous to the visit.[1]

Supplementing the above effort, the Extension personnel in both counties were supplied with two pocket-sized pads of similarly organized forms to record (1) their contacts with demonstrators and (2) their utilization of the demonstration farms in their educational program (see Figures 5 and 6). Although none of the Extension agents involved found it convenient to cooperate in using this data collecting device, the associate county agent in Susquehanna County kept a fairly detailed record of all his activities in his personal date book, and cooperated by periodically recording on tape an account of all those activities having to do with demonstrators and the use that was made of demonstrators and demonstration farms in winter meetings, tours, field days, twilight meetings, and the mass media.

One other available source of data was utilized in an attempt to determine program inputs. All articles which appeared in the local newspapers about agricultural or extension activities in the

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[1]The Extension agent in charge of the program in Indiana County insisted on introducing the contact slips to the Indiana demonstration farmers himself, believing their cooperation would be more effectively elicited than if introduced by the investigators. Whatever the reason, however, the Indiana cooperators did not participate in this phase of data collection.

EXTENSION STAFF CONTACT WITH DEMONSTRATOR(S)

Agent and/or specialist:

.....

Demonstrator(s): .....

WHERE OR HOW?

- ☐ On demonstration farm
- ☐ In extension office
- ☐ At a meeting (i.e. D.H.I.A., Exec. Comm., etc.)
- ☐ Telephone
- ☐ Letter
- ☐ Other (specify): .....

INITIATED BY?

- ☐ Agent and/or specialist
- ☐ Demonstrator(s)

Date: ..... 196.....

SUBJECTS OR PURPOSE (Check all that apply; circle main one):

- ☐ Farm management
- ☐ Fertilizer or lime
- ☐ Hay or forage crops
- ☐ Silage
- ☐ Grain crops
- ☐ Pasture
- ☐ Weed control
- ☐ Dairy herd management
- ☐ Feeding
- ☐ Machinery or equipment
- ☐ Farm buildings
- ☐ Prices or markets
- ☐ Record-keeping
- ☐ House or homestead
- ☐ Check plots
- ☐ Use of dem. farm for meeting or tour
- ☐ Other (specify): .....

Figure 5. Contact slip which was provided for the extension agents to record staff contact with the demonstrators.

USE OF DEMONSTRATION FARM

Agent: ..... **Date:** ..... **196**.....

Demonstration Farm(s): .....

CITED IN:

- ☐ Radio or TV program
- ☐ Newspaper article
- ☐ Newsletter or mailing
- ☐ Meeting
- ☐ Farm or home visit
- ☐ Other (specify): .....

USED FOR:

- ☐ Tour or meeting
- ☐ Visit or inspection by individuals
- ☐ Other (specify): .....

STATE DETAILS BRIEFLY ON OTHER SIDE

SUBJECTS OR TOPICS (Check all topics covered; circle main one):

- ☐ Farm management
- ☐ Fertilizer or lime
- ☐ Hay or forage crops
- ☐ Silage
- ☐ Grain crops
- ☐ Pasture
- ☐ Weed control
- ☐ Dairy herd management
- ☐ Feeding
- ☐ Machinery or equipment
- ☐ Farm buildings
- ☐ Prices or markets
- ☐ Record-keeping
- ☐ House or homestead
- ☐ Check plots
- ☐ Use of dem. farm for meeting
- ☐ Other (specify): .....

Figure 6. Information form which was provided for the extension agents to record use made of the demonstration farms or farmers in the total extension program.

two counties were reviewed. The content of the articles was the analyzed and coded according to coverage given (1) to the demonstration farm program in general, (2) to individual demonstration farmers, and (3) to subject matter with respect to crops and/or practices which received emphasis in the demonstration program. A monthly Farm and Home News, published by the Farm and Home Publications of Binghamton for the Agricultural Extension Associations of Susquehanna and Bradford (neighboring) Counties, was also similarly reviewed and the pertinent data coded.

Field days were held on three of the demonstration farms during the five-year period. Two of these field days were observed by the investigators and a record of attendance kept at both. Nine months after each, a sample of the farmers in attendance was interviewed to determine what information was actually conveyed to and retained by those in attendance, and whether the ideas and practices demonstrated had stimulated adoption, or consideration of adoption, by the viewers.

Benchmark and Terminal Surveys

In June of 1962, 620 dairy farmers in Indiana and Susquehanna Counties were interviewed in person, on their farms to obtain a benchmark against which to measure the change which would take place in the two counties over the next four years. Limitations of funds available for interviewing necessitated a selection of demonstration farms around which data would be collected. An examination of the location of the demonstration farms in Indiana County revealed that all but

one of the demonstrators were located in the lower two-thirds of the county. The other demonstrator's farm was near the northern boundary of the county, remotely distant from the others (see Figure 7). Therefor it was decided to interview all dairymen shipping fluid milk in the southern two-thirds of the county.

In Susquehanna County six of the nine demonstrators were located roughly on a diagonal line from the southwest corner to the mid-northeast border of the county. Interviews were taken, then, of all dairymen shipping fluid milk in a diagonal band ranging from eight to 11 miles in width (following topographical boundaries) from the southwestern corner across the county to the mid-eastern boundary. The other three demonstration farms are located in the southern tier of the county. One was chosen at random, and the dairymen within a four to seven mile radius around him were interviewed (see Figure 8).

In Susquehanna County this included practically all farmers within that area and numbered 406. Indiana County has a more diversified agriculture. The number of respondents there was 214, which represented approximately one-half of the farms in the geographical area in which interviews were taken. In both counties the number of dairymen interviewed was roughly one-third of the total number of dairymen in the county.

The terminal survey was conducted in the fall of 1966, following the harvest, so that five growing seasons are included in the intervening period. An attempt was made in the terminal survey to interview the same farm operators as those interviewed in 1962.

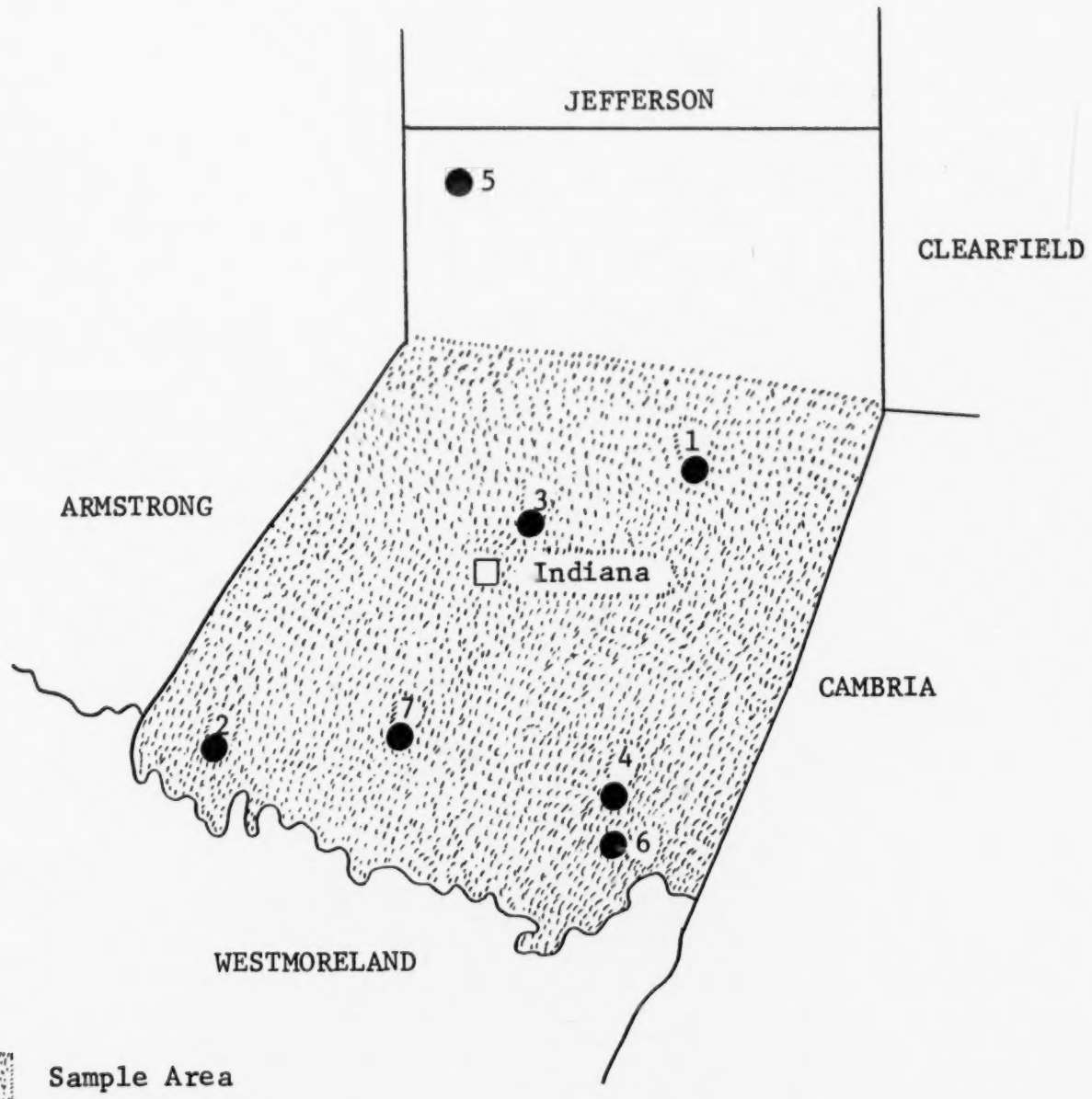

Figure 7. Indiana County, showing location of demonstration farms and area in which benchmark and terminal surveys were made.

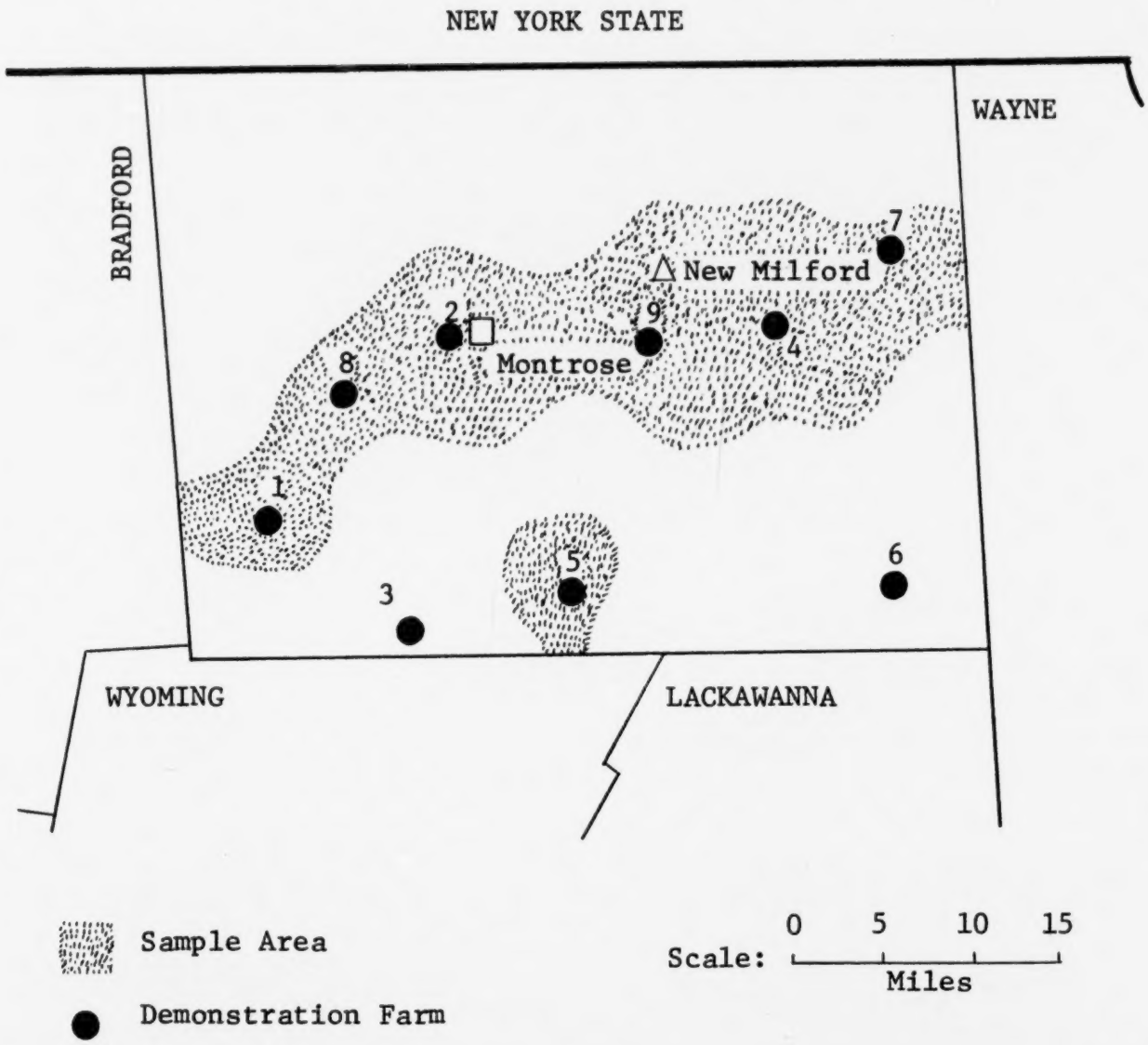

Figure 8. Susquehanna County, showing location of demonstration farms and area in which benchmark and terminal surveys were made.

However, 28 percent of the Indiana and 37 percent of the Susquehanna samples had, in the meantime, died, retired, or dropped out of dairy farming. An additional 21 farmers (15 in Susquehanna County and six in Indiana County) refused to be interviewed again. Therefore, the number of terminal interviews obtained from farmers in the original sample is 387. The sample of respondents for this thesis consists of these 387 dairy farmers, 148 in Indiana County and 239 in Susquehanna County, situated in those areas immediately surrounding 13 of the demonstration farms in the two counties.[2]

The Interview Instruments

Two major concerns guided the construction of the interview instrument for the benchmark survey: (1) that the data collected be similar to that of previous diffusion-adoption research, in order that findings in this study would be comparable to the results obtained by other investigators; and (2) that the data gathered would be relevant with respect to the content and emphases of the educational program to be built around the demonstrations.

The university specialists provided criteria for evaluating the critical factors associated with the agricultural setting in the

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[2] In about one-third of the cases of farm "drop-outs," another operator was dairying on the same farm in 1966. Although these replacements were interviewed in the terminal survey, their data are not considered in this analysis. Since we are looking at the change that occurs between two different points in time, many of the variables which will be examined are not comparable, unless the same farm operators are involved at both points in time.

two counties, and, as stated previously, predicted in what general areas and specific subject matters the emphases of the educational program would be directed.

Accordingly, the benchmark instrument included questions concerning details descriptive of the farms; indicators of the level of general agricultural technology, management skills, and farm practice adoption; information on the participation patterns of the farm operators in formal and informal activities; contacts with both generalized mass media and sources of specialized technical information; interpersonal visiting and communication network patterns; and a sampling of attitudes, goals, and values held by the dairy farmers.

The terminal instrument was a duplicate of that used for the benchmark instrument in most respects. The major exception was in the area of farm practices. Again in consultation with the extension specialists, the content of the educational program was evaluated to determine what practices were, in fact, recommended to the demonstration farmers and emphasized in the educational program. On the basis of this information the number of practices about which information was solicited was reduced.

Despite pretesting of the benchmark instrument, the investigators were not completely satisfied with all of the data collected about social participation and communication channels. Slight revisions were made in the form and content of the questions in the terminal instrument in an attempt to improve the resultant data gathered.

An important addition to the terminal interview instrument was the inclusion of a series of questions on the demonstration farm program. Information was obtained on general awareness of the program, specific knowledge of recommended practices, personal acquaintanceship with the demonstrators, and an evaluation of the ideas and practices which had been introduced on the demonstration farms.

In the instances of both the benchmark and terminal surveys the length of time required for interviews ranged from 50 minutes to two hours, with the average being approximately 75 minutes. Interviewers were university students, both graduate and undergraduate. All but two were from the College of Agriculture and had farm backgrounds. Before being sent into the field, they underwent a series of three training sessions in which they were advised of the purpose of the study, familiarized with the interview instrument, and exposed to several tape-recorded pretest interviews with dairy farmers located near the Pennsylvania State University. The first day in the field was spent in one or two practice interviews with dairy farmers outside the geographical boundaries of the study, followed by intensive evaluation sessions with the field supervisor. All completed interview schedules were checked, and interviewers were required to call back to obtain missing or incomprehensible data.

CHAPTER V

PROGRAM INPUTS

The educational or action program examined in this study was one of a series of educational programs carried on cooperatively by The Pennsylvania State University and the Tennessee Valley Authority. It involved the periodical establishment of a number of demonstration farms within selected counties in Pennsylvania. With the assistance of university extension specialists, the county extension staff built a five-year educational program around the demonstration farms. In 1961, R. E. Larson, Director of Agricultural Extension Service of The Pennsylvania State University contracted with Gerald G. Williams, Director of the Division of Agricultural Development of the Tennessee Valley Authority, under Contract TV-188-27A and Project Agreement No. PA-511.1 to add Indiana and Susquehanna Counties to the program, beginning January 1, 1962.

These two new counties represented entirely new area soil situations not before present in counties in the program. Indiana County had a typical soil type and farm enterprise combination prevalent in several counties in west central Pennsylvania. Susquehanna County's soils and type of farming was representative of a large area of the northern tier of Pennsylvania where grass, legumes, and dairying are the major enterprises. High acidity and low phosphorous content of the soils represented major problems.

Selection of the Demonstration Farms

In the fall of 1961, nine demonstration farms were selected in each of the two counties. The selection committee in each county was composed of members of the Extension executive committee, bankers, businessmen, and farmers.[1] Several criteria were proposed in the project work plan to be used in the selection of these test-demonstration farms. They are:

(1) The farms were to be distributed geographically in the counties in order to represent different communities. Whether the resulting distributions represented different communities in the eyes of the selection committee is unknown to the investigators.

(2) A second criterion was the visibility of the farms to the general agricultural public. There would be little point in carrying out a demonstration at a spot where no one would see it. For the most part, the farms selected in both counties have a high degree of visibility, at least to their immediate neighborhood. Of the 16 that remained in the program for the full five years, only

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[1]The committees were to have made their selections before information about the program became known to the candidates. However, two of the demonstrators who were eventually chosen in Susquehanna County learned of the proposed program through personal acquaintances on the Extension executive committee and specifically requested that they be considered by the selection committee as possible demonstrators. In each county, one of the members of the Extension executive committee was selected as a demonstrator. Whether or not this occurred at their own request is not known to the investigators. One of the demonstrators chosen in Indiana County is a former assistant county agent in one of the northern tier counties. It is quite probable that he was chosen as a demonstrator because of this background.

one could have question raised about its selection with respect to visibility.

(3) Certain factors concerning the individual farm operators were also considered, including age, management ability, education, economic status, and position in the community as a potential leader.

Originally nine demonstrators were selected in each county. However, before the program began in January, 1962, one of the Indiana cooperators dropped out and was not replaced. During the second year another one dropped out. He had agreed to cooperate only under the influence of his father. When his father died, he dropped out. The same year a Susquehanna demonstrator took up other employment, but his farm remained in. A young neighbor, who was also a prospective son-in-law, took over the farm and assumed most of the responsibilities associated with being a demonstrator.

Responsibilities of Demonstration Farmers

The demonstration farmers indicated their willingness to cooperate with the program by entering into a formal agreement with the Extension Service and TVA. According to the terms of this contract the demonstrator agreed--

(1) To develop a long-term farm and home plan including:
    (a) a fertilizer program;
    (b) a land management program including drainage and erosion control;
    (c) a livestock improvement program including breeding, feeding and management;
    (d) a program for efficient use of labor, power, machinery and buildings;
    (e) a home improvement program.

(2) To follow the program outlined for the principal fields of his farm as follows:
   (a) to apply the fertilizer supplied by the Tennessee Valley Authority to the fields as scheduled;
   (b) to secure and apply at his expense lime and/or other fertilizers as recommended by the Extension Service insofar as capital permitted;
   (c) to leave untreated such areas as might be designated for use as check areas for comparison with treated areas;
   (d) to keep and furnish a farm account record on forms supplied by the Extension Service and to keep and furnish such other records as date of harvest, yield, and unusual weather, insects, or disease conditions, as the Extension Service recommended;
   (e) to permit the Extension Service to make such visits and to arrange for such meetings on the farm as might serve to acquaint people of the community with results of the farming practices followed;
   (f) to grant the Extension Service and the Tennessee Valley Authority the right to use the data of the results in correspondence, publications and lectures;
   (g) to take soil samples and pay the expense of testing.

Role of the Extension Service

Certain obligations were outlined also for the Extension Service in the formal agreement, which was signed by the county agent and a representative of the state Extension Service. The Extension Service agreed to assist the demonstrators in making the essential surveys, soil tests, farm business analyses, and livestock, equipment and land utilization plan. The Extension Service also furnished, at cost, a farm account record form on which a beginning inventory, a record of farm receipts and disbursements, and a closing inventory for each year could be recorded. In Susquehanna County, the

associate county agent conducted a series of five training sessions for the nine demonstrators in record keeping, using the correspondence course from The Pennsylvania State University as the basis. All nine demonstrators participated and completed the course.

In both counties the associate county agent was given the responsibility of working directly with the demonstrators. This included assisting the demonstrators to set out their check plots, making yield checks, and generally providing counsel for the variety of questions and problems that arose. The diary of activities kept by the Susquehanna County associate agent indicates that an average of 13.5 visits were made to each demonstrator's farm annually during the five years.

Agronomy and farm management extension specialists from the University visited the demonstration farms periodically. Late each fall the specialists met with the demonstrators in each county as a group, mainly for the purpose of ordering fertilizer.[2] At this time many management problems also were discussed with each demonstration farmer. The farm of each demonstrator was visited at least once a year by the specialists also. This visit usually

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[2]The nitrogen and phosphate ingredients for the fertilizer used by the demonstrators was supplied by TVA at a slightly reduced rate--approximately 75 percent of local prices. It was shipped bulk from TVA plants, and mixed locally in each county with the necessary potassium requirements.

occurred in midsummer, late enough in the season to identify field problems, but early enough to make recommendations toward correcting such problems.

The agronomy and farm management as well as other university extension specialists were available to the demonstrators during the five-year period on a need basis, and under such circumstances made numerous calls to several of the demonstration farms. Several of the demonstrators built new barns, while others made extensive changes or additions to their facilities. A few of the farmers had soil problems which required more than cursory study. There were recurring problems in herd management and animal health. In each instance the appropriate extension specialist met with the demonstrator individually and assisted the county staff in guiding the farmer in overcoming his problem.

Of course, the primary responsibility of the county staffs was to develop an educational program that would induce the adoption by other farmers in the two counties of the recommended farm practices introduced and/or used on the demonstration farms. No guidelines or counsel was given to the county staffs in this area. The staff in each county was left on its own to develop the kind of educational and publicity program that it considered most effective in disseminating the information and ideas utilized on the demonstration farms to the farmers in the surrounding neighborhoods and to the agricultural community of the counties as a whole.

In both counties, the progress of the demonstration farmers was noted in newspaper articles and extension radio programs.

Special educational meetings and field days were held on various demonstration farms. The demonstrators themselves were called on frequently at extension and other agricultural meetings to describe what they were doing on their farms. To a more or less degree, the demonstration program was integrated into the ongoing program of the county extension staff.

Program Content

Before the educational program was implemented in the field, the investigators interviewed University extension specialists to determine what specific content areas would be included in the educational input. Four broad areas were indicated: agronomy, agricultural engineering, dairy science and farm management. Stress would be laid on helping the demonstrators develop over-all farm management skills with emphasis on fertility and a well-balanced crop program that would effectively meet feeding needs for high milk production. Supplementary areas such as herd management and equipment and building needs would receive attention on the basis of individual needs of demonstrators.

Specifically, the following subject items received considerable emphasis, both in the recommendations to the demonstrators and in the use of the demonstration farms in the overall educational extension program to the agricultural community of the counties.

(1) Use of complete farm record and account books; recording accurately fertilization, seeding, and

crop information for every field; herd health and milk production records for every cow in the herd; as well as all financial records. These records were to be used as a basis for management decisions in crop and feeding programs and in purchasing new equipment.

(2) Use of complete soil analysis tests for every field, including pastures, to determine lime and fertilizer needs. Demonstrators followed this practice every year; it was recommended in the educational program that soil tests should be staggered so that each field is tested at least once in every three years.

(3) Increased use of alfalfa and/or trefoil for hay and forage needs. In Susquehanna County where there was much "wet-land" and where there was more of a problem with weevil and leaf-hopper damage, trefoil received greater emphasis. Sowing these legumes without a nurse crop was a totally new practice introduced during the five-year program and was highly recommended.

(4) Increased use of corn for silage and for grain. This was particularly true in Susquehanna County where very little corn was grown at all. Corn

produces an ensilage with a higher TDN per acre than most grass crops.

(5) Production of corn-after-corn on the same land in those fields where erosion can be controlled adequately, thus making more efficient use of herbicide applications.

(6) Use of proper, and appropriately timed applications of herbicides and pesticides. Atrazine was recommended for weed control in corn; 2-4DB for weed control in sowing legumes without a nurse crop. Emphasis was placed on proper timing in spraying alfalfa for control of leaf-hopper, spittle-bug, and alfalfa weevil.

(7) Use of forage testing with subsequent adjustment of the protein level in the dairy ration.

(8) Band-seeding of grass crops.

(9) Use of a side-band attachment on the corn planter.

Educational Techniques Employed

There appeared to be a distinct difference in the scope of the educational program developed by the Extension staff in the two counties. The rationale in both cases, however, was the same: the five-year drought in Pennsylvania.[3] In Indiana County, the

[3]Pennsylvania, along with much of the Northeast, experienced a five-year drought that coincided with the five-year TVA

county staff member in charge and all but two of the demonstrators felt that because of the drought, there were few visible results to demonstrate. (The one exception was Demonstrator No. 2, the former extension agent.) Therefore, signs were never erected on the demonstration farms advertising them as such, and the demonstrators expressed a hesitancy to publicize the fact that they were demonstrators. The county staff expressed the same feeling. Although the results of the demonstration program were given recognition and utilized in the overall extension program, the demonstration program as such did not appear to receive great emphasis. None of the demonstrators were interviewed on a radio or TV program, and the number of articles in the newspapers mentioning the demonstration farms were few. A total of only 10 articles appeared in the local newspaper over the five-year period, three each in 1963 and 1965 and four in 1966.

In Susquehanna County, on the other hand, both extension staff and demonstrators seemed to feel that the drought conditions tended to accentuate the results obtained on the demonstration farms in comparison with yields obtained on surrounding farms. There, extensive publicity was given to the demonstration farm program.

Test-Demonstration Program under study. During those five years, 1962-1966, the average precipitation deficiency, in inches, for the five-month period, April through August (the growing season), at the three U.S. Weather Bureau stations within the sample area in each county were as follows:

Indiana County	-5.71, -5.22, -4.48
Susquehanna County	-5.29, -4.35, -5.76

Many articles about the demonstrators and the results they were achieving on their farms were printed in the local newspaper--44 over the five-year period. Something about the demonstrators and/or their farms was mentioned on an average of twice weekly in the county agents' radio programs. In addition, several of the demonstrators themselves appeared on radio and TV programs. A number of these programs originated on the demonstration farms. The farms were also the scene of numerous meetings and two field days during the summers; the demonstrators quite frequently gave testimony at winter meetings sponsored by Extension and other agricultural organizations or businesses. Four-by-six-foot signs announcing that this was a demonstration farm were displayed prominently at each of the farms.

Extension Staff Contact with the Demonstrators

The associate county agent in Susquehanna County kept a rather complete account of his activities with respect to the demonstration program. From this record, the relative frequency with which extension personnel interacted with demonstrators and the relative emphasis given to various content subjects during these personal contacts can be assessed. Also available from this record is an indication of the utilization of the demonstration farm program in the total extension educational program.

Over the five-year period a total of 626 personal contacts were reported with the nine demonstration farmers. Contacts with individual demonstrators ranged from 52 to 112 (see Table 1), with the

Table 1. Frequency of Personal Contact of Extension Staff with Individual Demonstrators, Susquehanna County (N=626).

	Percent
Demonstrator No. 9	18
Demonstrator No. 8	13
Demonstrator No. 2	12
Demonstrator No. 3	12
Demonstrator No. 6	10
Demonstrator No. 4	9
Demonstrator No. 1	9
Demonstrator No. 5	9
Demonstrator No. 7	8
Total	100

variance explained partially by the fact that special situations encountered on various demonstration farms from time to time necessitated individual attention by county staff or specialists.

These contacts were distributed rather evenly over the five-year period. No less than 17 percent nor more than 22 percent of the contacts occurred in any one year. There was somewhat more variation evidenced in the distribution throughout each year, however. As might be expected, the peak occurred in the summer months. In fact, with the exception of February when winter extension meetings were held, the number of contacts throughout the year resembled somewhat a normal distribution curve (see Table 2)--approximating generally the amount of activity on the farm oriented toward field and crop work.

The most frequent subject matter covered in these contacts was total farm management. Recommendations of extension specialists

Table 2. Frequency of Personal Contact of Extension Staff with Individual Demonstrators by Month of Year, Susquehanna County (N=626).

	Percent
January	5
February	10
March	7
April	7
May	9
June	16
July	10
August	10
September	10
October	7
November	6
December	3
Total	100

are often given in terms of optimum advantage to that particular specialist's subject area without consideration of possible conflict with other areas, particularly with respect to time and labor management. One of the emphases of this program, in addition to the keeping of a complete record and account system and its utilization in decision-making, was the integration of all recommended practices into a balanced management program.

The next most frequently involved topics in these contacts were soil fertility and crop program management, including the discussion of individual crops. Other topics of frequent discussion were feeding programs, buildings and equipment, herd management, and weed control in that order.

Seventy-eight percent of these contacts were made on the demonstrators' farms. About 10 percent were made in the extension

office. The balance took place at a variety of other places. Telephone conversations with the demonstrators were not included in this enumeration.

Use of the Demonstrators and Demonstration Farms by Extension

The Susquehanna County extension staff employed numerous methods to bring the results of the demonstration farm programs to the attention of its total clientele. Undoubtedly, the most frequently used media was the daily radio program. Although no accurate record was kept, the staff estimated that they referred to something on or about one of the demonstration farms two or three times a week on their daily program. As was mentioned before, several taped radio programs originated from the demonstration farms and demonstrators were frequent guests on "live" programs. In addition, there was a series of four special TV programs on the demonstration farms.

Next in frequency of use was the utilization of the demonstration farms as sites for meetings, tours, or field days. Twelve twilight meetings were held on various of the demonstration farms over the five-year period. There were two field days, one on Farm No. 3, and one on Farm No. 9, which were all-day programs. In addition, all nine of the farms were used from time to time for tours and inspections involving groups ranging in size from several individuals to several dozen people. There were 61 such visits to demonstrators' farms.

Demonstrators were called upon frequently at winter meetings and other extension gatherings to "testify" on what they were

accomplishing on their farms or to substantiate reported results which they had achieved through the use of recommended practices.

There was some variation in the use of demonstrators and/or demonstration farms in meetings, tours, field days, etc. This was partially due to variable results being obtained on certain farms during certain years, and varied also with the willingness and articulateness of various demonstrators. Farm No. 3 was used most frequently (in 15 percent of the instances); Farms No. 1 and No. 6 were next in frequency of use (13 percent). In only 5 percent of the instances when demonstration farm material was utilized in educational presentations were there no references to any one of the farms or farmers.

An analysis of the content of these meetings and tours showed that there was no one subject matter which predominated over other emphases in the program.

Content Analysis of Newspaper and Circular Letter Articles

Brown, et al. (1967:10f.) found that farmers prefer to receive agricultural information in printed form. Given a choice of seven alternative channels of information the first two preferences were "newsletter from the county agent" and the newspaper. There are several possible explanations for this. Printed material can be absorbed at one's own speed of comprehension. It also has the advantage of being handy to save and to read or study again, perhaps at a time when the information contained therein is most appropriate.

Since the Susquehanna County extension staff made extensive use of both of these media in attempting to reach the farmers in the county, a study was made of the articles which appeared in the Montrose Independent, a Susquehanna County weekly newspaper published in Montrose, the county seat, and in the Farm and Home News, published by the Farm and Home Publications for the Agricultural Extension Associations of Bradford and Susquehanna Counties. Mailing lists are supplied to the publisher of this latter publication by the county agent. Eighty percent of the farmers in the study sample received the Montrose Independent and 62 percent reported receiving the Farm and Home News.

During the five-year period a total of 62 articles appeared in these two publications reporting something directly connected with the demonstration farm program, usually discussing one of the subject-matter areas which received emphasis on the demonstration farms. This figure does not include general releases from the University or the United States Department of Agriculture; only articles having a local reference were considered. Of that total, 44, or 71 percent, appeared in the Montrose Independent.

As was true with the other educational techniques employed by the extension staff, the frequency of articles appearing in any one of the five years of the program varied little. However, there is an interesting distribution across the months (see Table 3). February, July and October are all heavy months, reflecting the reporting of winter meetings, early legume harvests and spraying periods, and final crop harvest reports, respectively.

Table 3. Frequency of Newspaper and Farm and Home News Articles on Demonstration Farm Subjects, by Month, Susquehanna County (N=62).

	Percent
January	5
February	11
March	8
April	8
May	6
June	6
July	11
August	10
September	10
October	13
November	10
December	2
Total	100

Most of the articles examined contained information on more than one topic. No attempt was made to determine the relative amount of coverage given to each topic within articles. Solely on the basis of frequency of mentions, the subject presented or reported most often was that of weed and pest control. This is understandable considering the problem of cultivating the rocky soil of Susquehanna County and weevil and leaf-hopper damage in the county during the five-year period. The second topic in frequency of coverage was legumes (alfalfa and trefoil), followed closely by soil fertility (see Table 4).

Differences Between Counties in Program Inputs

It has been indicated that there appeared to be a difference between the counties in program inputs on the part of the county

Table 4. Frequency of Topics Related to Demonstration Farm Program Appearing in Newspaper and Farm and Home News Articles (Susquehanna County).

	Percent
Weed or pest control	46
Legumes	39
Soil fertility	36
Feeding program	32
Buildings and equipment	29
Crop program (general, and other than legumes and corn)	28
Demonstration farm program (general)	26
Corn	20
Herd management	14
Miscellaneous	49

staffs. It was evident that the associate county agent and all but one of the demonstrators in Indiana County had strong feelings that the yields obtained on the demonstration farms were far below par because of the drought and "not worth crowing about." As one demonstrator said, "I'm not telling anyone I'm a demonstrator until I have some results to show off." Rather than compare their yields with those of their neighbors, they were comparing them with the expectations created by the extension specialists before the beginning of the program, which, of course, did not take a possible drought into consideration.

Whether these attitudes were concomitant with an actual reduction in program inputs by the extension staff, as appearances

seem to indicate, is difficult to judge without rigorous evidence. It is definite that none of the demonstrators appeared on a radio or television program, nor did any programs originate from a demonstration farm. It is also known that only 10 articles about the program in general, or demonstration farms in particular, appeared in the local newspaper. Indiana demonstrators reported a total of five educational meetings taking place on various of their farms during the five years, only two of those being sponsored by the extension office. The others were sponsored by the A.S.C.S. office, S.C.S., and a Vo-Ag group. On the other hand, the Susquehanna demonstrators reported a total of 15 educational programs being held on their farms during the five years, all but two of them sponsored by the county extension office.[4]

There is no evidence available to determine what use the staffs of both counties made of demonstration farm results in meetings and programs not held on the demonstration farms, such as "winter meetings," or meetings sponsored by other agricultural organizations in which extension staff members participated. Another unknown quantity is the actual use of demonstration farm results in the

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[4]How accurate the recall of the demonstrators is for a period of five years duration is a point of possible question. Since the Indiana farmers were rather dissatisfied with the program, they may have exhibited a tendency to under-report program activities, whereas the relatively well-satisfied Susquehanna farmers may have over-reported. However, only one reported more than two meetings occurring on his farm during the duration of the program, which does not give much margin for over-reporting.

county agents' radio programs. Although the Susquehanna County staff estimated a minimum of two mentions per week in their programs, there is no hard evidence to substantiate this.

It is the observation of the investigator that the Indiana associate county agent was the type of person who would underplay his commitment to such a program. He seemed to place little value on input activities, but indicated that results were the important things. Therefore, he was reluctant to indicate just how much effort he was contributing to the program. It is quite possible that his inputs were considerably greater than those reported. Had his judgment of the accomplishments of the program been more positive in the form of expected results, his reporting of inputs might have been more definitive.

However, it is the evaluation of the investigator that there was less organization in terms of specific goal oriented activity in the program in Indiana County than in Susquehanna County. This evaluation is based on the data presented above and in the previous pages of this chapter. The investigator recognizes the limitations of these data.

Goals and Objectives

The description of the educational program thus far has dealt with activities, techniques, and material content. Nothing has been stated about the objectives or goals of the program. At the outset, it is to be recognized that in any program there are varying

levels of objectives. First, not all objectives are achieved simultaneously. In fact, there may be an ordered series of goals, in which the implementation of program activities toward achieving some are dependent on the successful attainment of other "lower level" goals. It is also true that not all members of the target audience are at the same level of development with respect to the ultimate aims of the program. Therefore, objectives must be discriminatory with respect to the various stages represented by segments of the audience.

For example, the ultimate goal of the educational program under study was to induce the farmers in the two counties to adopt the recommended farm practices being demonstrated on the demonstration farms. Except for such a practice as sowing legumes without a nurse crop, however, most of the demonstrated practices had already been adopted by a segment of the farmers in the community. There are always some farmers who have thought about adopting them. Finally, there are always some who have no knowledge whatsoever of certain practices. Therefore, the objective of an educational program with respect to the last mentioned group would be first to acquaint these persons with such practices. This goal would be inappropriate for all other segments of the audience. At the same time, this goal must be achieved among those to whom it is applicable before implementing a more advanced aim, such as stimulating motivation to obtain specific information about these practices.

The goals and objectives of the TVA demonstration farm program in Indiana and Susquehanna Counties were never explicitly

stated as such, either in writing or orally in conversation with the program administrators. The overall program had been in existence in Pennsylvania for so long, with the same personnel providing leadership on the state level, that most of the criteria for evaluating the success of the program were unexpressed, idealized understandings which were seldom discussed explicitly among the program administrators and leaders. When questioned about specific goals, responses were structured around some of the things that were achieved in previous programs in other countries, or in such terms as "what we'd like to see happen here is . . . ."

As the program progressed in time, the content of the ultimate goal became rather clear. The administrators were interested in having the dairy farmers of the two counties accept (adopt) the specific recommended practices which were introduced or utilized on the demonstration farms. However, they were aware that this ultimate goal was not to be achieved directly, but that for many farmers they had to produce first an exposure to these practices within a local setting, and at the same time create among those farmers who were not knowledgeable about them an awareness of the practices. Once awareness had been achieved, the objective was to stimulate interest at a high enough level that the dairymen would be motivated to seek (more) information on the practices. The activities of the program provided opportunities for the dissemination of information and advice. The next objective was to motivate the farmers to try the recommended practices, at least on a trial basis. If this process had been

carried through successfully, the ultimate objective of general acceptance and adoption of the practices would follow.

This ordering of the hierarchy of objectives can be presented as in Figure 9. The most immediate objective is that of inducing change among the demonstration farmers. (As was pointed out in Chapter II, most of the evaluative studies done on demonstration farm programs have focused on the change which has occurred here.) The aims of the program then ascend in order as the prior steps are achieved. The attainment of all the intermediate goals will enable, in the sense of facilitating conditions, the achievement of the ultimate objective.

The objectives presented in Figure 9 have been arbitrarily chosen, or imposed, by the investigator in the absence of explicitly formulated objectives on the part of the action program leaders. Certainly this ordering is not completely definitive or inclusive. It represents, however, in the opinion of the investigator, the essential stages as perceived by the program administrators. It is to be noted that several objectives are related to the program itself. For example, objectives 1 and 5 are integral aspects of the program. The other six goals describe desired effects which are to be produced by the program.

In the reporting of previous demonstration studies there seems to be no consistent pattern of considering the result demonstration an entity separate from the educational program or as an integral part of the program. Some writers speak of the educational program

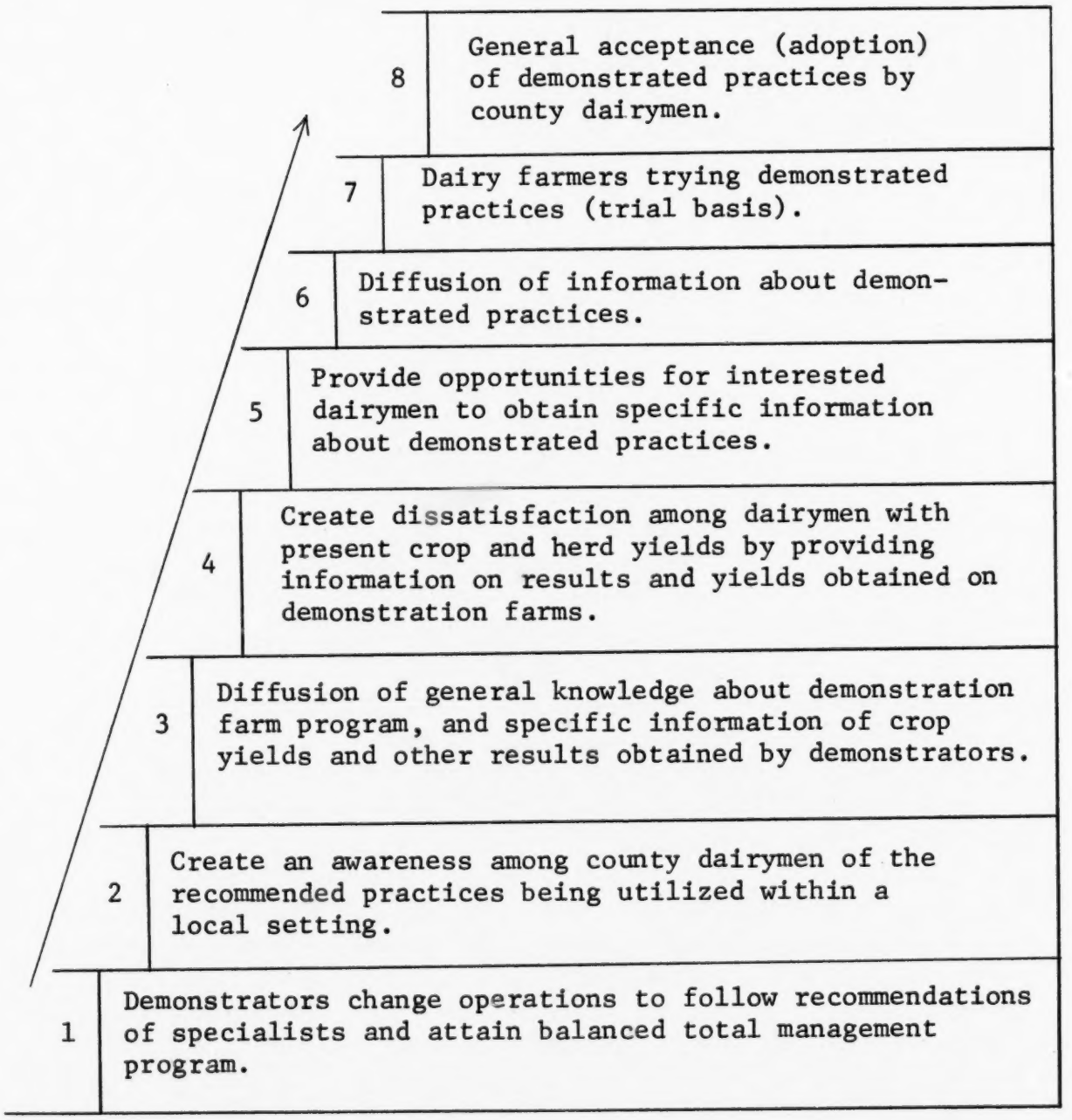
8
General acceptance (adoption) of demonstrated practices by county dairymen.
7
Dairy farmers trying demonstrated practices (trial basis).
6
Diffusion of information about demonstrated practices.
5
Provide opportunities for interested dairymen to obtain specific information about demonstrated practices.
4
Create dissatisfaction among dairymen with present crop and herd yields by providing information on results and yields obtained on demonstration farms.
3
Diffusion of general knowledge about demonstration farm program, and specific information of crop yields and other results obtained by demonstrators.
2
Create an awareness among county dairymen of the recommended practices being utilized within a local setting.
1
Demonstrators change operations to follow recommendations of specialists and attain balanced total management program.

Figure 9. Hierarchy of objectives of the educational program.

which is complementary to the result demonstration, or vice versa. Others see it as a technique which is part of a larger whole. It is obvious from the discussion of goals and objectives above, that the result demonstration is not viewed in this study as something apart from the educational program of the county extension staffs. On the contrary, the demonstration farms become the central "hub" of the educational input in the total extension program. Therefore, when subsequently in this thesis the term program is used, it refers to the total educational program, including the demonstration farms, all activities that take place on them, and all meetings or other educational techniques which the county extension staffs employed to bring the "message" of the demonstration farms to their target audiences.

Comparing Effects with Objectives

Each of these objectives can be stated in the form of a hypothesis for the purpose of evaluative research. For example, objective 1, the most immediate objective of the program, could be translated simply: participation in the educational program as a demonstrator is positively associated with changes in the direction of acceptance of recommended farm practices. Such a hypothesis can then be tested by comparing the changes made by the demonstrators in the program to the changes exhibited by non-demonstration farmers. Indeed much of the previous research on demonstration farm programs has done just this, and consistently has substantiated the hypothesis --not surprisingly.

One of the policy decisions to be made in evaluative research concerns the choice of the levels of program objectives to be used in directing research efforts to determine the impact of the program. One possibility is to focus the investigation at determining the extent to which the program has achieved its ultimate or long-range goal. Suchman (1967:54) points out that there is a strong tendency in the areas of health and medical programs to evaluate solely in terms of the "ultimate criteria of success." On the other hand, the review of the literature on demonstration farm research has indicated an obsession with the other extreme--attempting to determine little more than the success of attaining the most immediate objective, that of inducing change among the demonstration farmers. Of course, one could proceed to determine the extent to which every level of objectives has been achieved. However, since in the study at hand each level of objectives is, in a sense, part of a cumulative chain of goals, each of which becomes a step in the process of attaining the next higher level, it is questionable whether the costs of such a procedure would justify the value of its results.

The decision of the investigator in this study was to obtain data with respect to two levels in the hierarchy of objectives as illustrated in Figure 9. The two areas are (1) knowledge among the county dairy farmers about the demonstration farm program generally and about the practices demonstrated specifically (level 3), and (2) adoption of the recommended practices (level 8).

Inasmuch as the previous research on demonstration farm programs has corroborated the fact that cooperators (demonstrators) in the programs do exhibit change in the desired direction as a result of their participation, this study assumes that such change will take place. Indeed, changes among the demonstrators are a necessary condition without which the program could not proceed any further. The demonstrators signed a formal contract at the outset of the program agreeing to follow all recommendations made by the extension staff, if it were feasible for them to do so. There is no reason to suspect that they would not attempt to honor this agreement. Information on the changes among the demonstrators was collected as a matter of course to verify the validity of the assumption. The focus of the investigation, however, is on the knowledge and changes exhibited by the non-demonstration dairy farmers in the two counties.

CHAPTER VI

METHODOLOGICAL TOOLS

Measurement of Change in Practice Usage--The Dependent Variable

The ultimate goal of the educational program was the general acceptance, or adoption, of those recommended practices which received emphasis on the demonstration farms. One of the primary tasks of this thesis, therefore, is to determine the change in usage of these recommended practices which occurred among the farmers surrounding the demonstration farms between the beginning of the program and its end. This change in practice usage from 1962 to 1966, then, is the dependent variable.

Information about the use of more than 40 recommended practices was obtained from each respondent in the benchmark and terminal surveys. At the beginning of the program, university extension subject-matter specialists had counseled with the investigators on the selection of a wide range of practices which would possibly be emphasized on the demonstration farms during the five-year program. At the end of the program, the three specialists who had worked most closely with the county staffs and the demonstrators[1] selected from this list those practices which they felt had received the most emphasis in the educational program.

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[1] James H. Eakin, Jr. and W. Wayne Hinish, agronomy specialists; and Frederick A. Hughes, farm management specialist.

There were 21 practices which received the vote of all three specialists. Through the use of a trace line analysis technique (Copp, 1960), 19 of these practices were incorporated into a practice usage index. All of the items were related consistently to the others in the index, and all had the ability to discriminate high and low scoring groups in the sample. The 19 practices included in the index were:

(1) Use of complete soil test for each pasture field at least once every three years.

(2) Use of complete soil test for each crop field at least once every three years.

(3) Regular use of lime on pastures (according to lime test).

(4) Regular use of lime on all crop fields (according to lime test).

(5) Topdressing pasture fields.

(6) Topdressing hay and/or legumes.

(7) Use of fertilizer on other crops.

(8) Use of alfalfa and/or trefoil as a grass crop.

(9) Band seeding of grasses.

(10) Use of spray for leaf-hoppers and/or spittle bugs.

(11) Use of spray for alfalfa weevil.

(12) Sowing legumes without a nurse or cover crop.

(13) Use of forage testing.

(14) Use of corn for silage.

(15) Use of atrazine for weed control on corn.

(16) Use of side band placement attachment on corn planter.

(17) Planting of corn after corn successively on same ground.

(18) Keeping of D.H.I.A. or other production records for each cow.

(19) Keeping of complete farm account record books.

Usually, in an index or scale of this type, the number of items endorsed or accepted is taken as an indication of the respondent's position on that variable's continuum, in this case the extent to which he has adopted the recommended practices. However, this raises a problem with respect to applicability. For example, if a farmer has no alfalfa stands, the spraying practice to control weevil is not applicable to his operation. If he practices "zero-grazing," fertility practices with respect to pastures are not applicable. If he does not grow corn, the use of atrazine for weed control is not applicable to his situation. In other words, the number of practices applicable to each farm varies, so that just a total score on the practice usage index would not be valid.

Therefore, the index was constructed to express quantitatively the fraction of the 19 practices applicable to a respondent's situation which he had adopted. For example, a farmer who did not grow corn in 1962, but for whom all practices not related to corn were applicable, and who was using eight of them, would have an index score of 8/15 or .533. If between 1962 and 1966 he began to grow corn for silage, but did not adopt the use of atrazine for weed control on his corn, nor use a side-band placement attachment on his

planter, nor plant corn after corn on the same ground, his index score would drop to 9/19 or .474. It can be argued that he has increased his level of practice adoption, but in terms of the emphasis of the demonstration farm educational program he has accepted only part of a complex of recommended practices.

The dependent variable is derived from the practice usage indexes of the two periods in time. It is the change in the practice usage index between 1962 and 1966. Operationally, this is obtained by subtracting the 1962 practice usage index score from that of 1966. A resulting positive value in the dependent variable, then, indicates an increased utilization of the recommended practices by the farmer. A negative value indicates the rejection of one or more practices, or a change in the farm operation which would make one or more of the practices applicable which were not applicable in 1962, as explained above.

It is recognized that this is but one alternative in measuring change. The dependent variable here is measuring the amount of change that occurs within a possible range of change. The disadvantage of this method is that it imposes a limitation upon those who have a high level of practice usage initially. For example, if a farmer was using 16 of the 19 practices in the practice usage index at the time of the benchmark survey, he had a potential of adopting only three more. The highest possible value of the dependent variable, change in practice usage, which he could attain, is +.158. On the other hand, if a dairy farmer was using only six of the 19 practices in the index in 1962, there was a possibility

of his score in the dependent variable being as high as .684. In other words, the early adopter is penalized.

Some studies of change have used not the actual change, but the fraction of potential change as the dependent variable. Applying this method to the example above, both farmers would have the same potential for amount of change, 1.000. In the event that each adopted two recommended practices during the program, and assuming that all practices in the index were applicable to both farmers' operations, the early adopter who had a high initial score (.842) on his practice usage index, would register a change score of .667, and the farmer who entered the period of the program with an index score of .316 would have a change score of .154.

This method appears to reduce some of the limitations imposed by the method of measuring change used in this thesis, with respect to those persons at the higher end of the scale. However, it is not perfect, for it introduces a problem of distortion, although of much less magnitude, at the middle range of the scale. Also, and perhaps more important, this alternative method of measuring change is most appropriately suited to measure change in a positive direction. In this thesis, however, it is desired that change in practice usage in both directions be noted, with respect to both the adoption and rejection of the recommended practices. The method used here lends itself quite well to registering negative change arithmetically.

A more viable argument supporting the method utilized here, though, has to do with the principal target clientele of the program

under study. An examination of the program content reveals that few of the recommended practices which received emphasis on the demonstration farms are really completely new. Several have been in existence and recommended by Extension for more than a decade prior to the beginning of the program. Therefore, we would expect that innovators, or even early adopters, would not be the persons most influenced by the demonstration farm program, since they would have already adopted many of the practices. In any event, one of the assumed primary functions of the result-demonstration is to have neighbors influence neighbors. The innovator or early adopter, on the other hand, is influenced more by mass media or specialized sources relatively close to original information sources (Copp, Sill and Brown, 1958; Lionberger, 1960:42-66; Rogers, 1962:148-253). The primary target of the demonstration farm program, then, is the slower adopter, who would be characterized by a lower level of practice usage index at the beginning of the program. Therefore, the method of measuring change utilized in this thesis, in which the greatest potential for change being registered in the dependent variable occurs among those in the middle and lower ranges of the practice usage index, would seem to be more appropriate than the alternative method, which has a tendency to accentuate the change exhibited by persons with high initial scores.

Factors Associated with the Demonstration Program--Independent Variables

One of the difficulties in evaluative research, such as the present study, is the fact that the researcher has no manipulative

control over the independent variables, or program inputs. In the study at hand, the investigators were non-participant observers. They were not involved in the administration of the program. This difficulty is compounded in the present study by the lack of any control design.[2] The problem for the investigator, then, is to come up with "empirical handles" for the educational program which are measurable and which can be related meaningfully to the possible program outputs.

Another problem which is peculiar to research on this kind of informal educational program is a function of the fact that participation in the program by members of the target audience is entirely voluntary. The program is set up by the Extension staff. They select a population of communication channels which they feel will provide the maximum potential in terms of the number of target audience members contacted and the amount of meaningful information transmitted. Whether the members of the target audience do, in fact, receive the messages transmitted, whether either by their own

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[2]The "Evaluation Statement" by TVA, made prior to the beginning of the program, which set forth "suggestions" for the evaluative research by Penn State, called for the selection of two groups of counties, one a control group with no demonstration farm program. The decision not to follow this suggestion was made before the writer joined the project, and it is not known why this decision was made. It is conjectured, however, that it would have been difficult to select two other counties that had not yet had a demonstration farm program which would have been good "matches" for Indiana and Susquehanna Counties as control samples. Certainly, another consideration in the decision to drop the control counties was lack of financial resources.

choice or by the matter of being "tuned in" or physically accessible to the channels carrying the communicative messages, presents a problem to the researcher with respect to devising independent variables which can be utilized as measures of the respondent's involvement in the educational program, or which are equivalent to what would be manipulation of the "cause" variable in experimental research.

The investigator will attempt to determine the involvement of the respondents in the educational program and to assess the relative effect of the program in inducing change in practice usage. To achieve this end, six variables were chosen as empirical "handles." They are as follows, with the unit of measurement where applicable:

(1) Degree of acquaintanceship with each individual demonstrator, measurement range 0-3.
   (a) Does not know the demonstrator (0).
   (b) Acquainted with the demonstrator (1).
   (c) Has had conversations with the demonstrator within the last three years of the program (2).
   (d) Has visited the demonstrator's farm within the last three years of the program (3).

(2) Distance from the nearest demonstration farm, measured in "concentric circle" integer miles.

(3) Distance from the nearest demonstration farm visited, if any, measured in "concentric circle" integer miles.

(4) Number of demonstration farmers with whom respondent has had conversations within the past three years.

(5) Whether or not the respondent attended a field day on one or more of the demonstration farms.

(6) Change in the respondent's participation in Cooperative Extension activities, measured by the differences between 1962 and 1966 extension participation scores.[3]

Previous research, both in demonstration farm research and in general diffusion indicate that distance is a significant factor in diffusion (Blackmore, Dimit and Baum, 1955; Hagerstrand, 1953). The rationale for using the distances both to the nearest demonstration farm and to the nearest demonstration farm visited is that the nearest demonstration farm may not be the one to which a target farmer is "oriented," directly or indirectly. For example, if he is located closest to Demonstrator No. 1, but is "oriented" to Demonstrator No. 3, either through personal acquaintance with the demonstrator himself or through neighbors or friends of the demonstrator, then there may be two separate influences toward change: the diffusion from the demonstration farm closest to him, and the diffusion from that farm toward which he is more consciously oriented. Of the three variables, "distance to the nearest demonstrator known,"

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[3]For the determination of the Extension participation score, see "Extension participation score" under "independent Control Variables" below.

"distance to the nearest demonstrator talked to," and "distance to the nearest demonstrator visited," all of which were highly intercorrelated, the last was most highly correlated with the dependent variable on a zero-level. Therefore, this one was chosen.

Change in extension participation is considered a factor associated with the demonstration program, inasmuch as the demonstration farm program was supposed to become the focus of the county extension staff's total educational program. As indicated in Chapter V, this appeared to be more the case in Susquehanna County than in Indiana County. Certainly, however, a great deal of the staffs' orientation and energies in both counties pivoted around the demonstration farms. Therefore, any change in a respondent's participation in extension activities after the beginning of the program would of necessity reflect an influence, or lack of it depending on the directions of change, of the demonstration program.

Independent Control Variables

In the Review of Literature it was pointed out that there are numerous variables exercising a systematic effect on change wrought by diffusion. In order to "control" for the effects of these influences, they will be included in a multiple design as independent variables.

When the data were gathered in both the benchmark and terminal surveys, information was obtained on all factors extraneous to the demonstration program but shown in previous research to be

influential in the diffusion process. A total of 30 variables was selected to be included in the multiple variate design as independent control variables. With their units of measurement, they are as follows:

(1) Size of operation.[4]

(a) Acreage farmed.

(b) Milking herd size.

(c) Change between 1962 and 1966 in equipment score. (This score is the decimal fraction expressing the proportion of those items of equipment or machinery which a respondent had of those, from a list of 12 selected items, which were applicable to his operation.) This list was compiled in consultation with agricultural engineering specialists as being relevant to the agricultural enterprises of the two counties. They are:

1) Silo

2) Mechanical silo unloader

3) Gutter cleaner

4) Stable ventilation fan

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[4]Unless otherwise noted, the measurement for all variables used is that taken from the benchmark data (1962). This is the level at which the respondents entered the period of the educational program.

5) Automatic cow feeders

6) Bulk milk tank

7) Side-band attachment on corn planter

8) Hay conditioner

9) Baler with thrower/kicker

10) Hay dryer

11) Forage harvester

12) Flail-type chopper

(d) Gross farm sales.

(e) Change between 1962 and 1966 in acreage farmed.

(f) Change between 1962 and 1966 in milking herd size.

(g) Change between 1962 and 1966 in equipment score.

(2) Management skills and practices

(a) Change between 1962 and 1966 in fraction of gross farm income from dairy enterprise (an indication of increasing or decreasing specialization).

(b) Fraction of time employed in off-farm employment (2000 hours/year considered full-time employment).

(c) Change between 1962 and 1966 in fraction of time employed in off-farm employment.

(d) Milking-time index score (number of minutes required to complete evening milking per number of cows being milked per number of milking units per number of persons doing the milking). Dairy science specialists recommended this index as an indicator of level of time-management skill.

(e) Age (in weeks) calves weaned from cow. Farm management specialists recommended this measure as an example of a measurable management practice. The longer the dairyman allowed his calves to suck on the cow, the poorer "managers" they were. Good managers weaned their calves at birth to the teat bucket.

(3) Social participation

(a) Formal participation score. The number of socially oriented organizations in which the respondent maintained active membership.

(b) Economic leadership score. The number of economically oriented organizations in which the respondent had served as an elected officer or board member during the three years prior to the survey.

(c) Frequency of attendance at church. Church membership was the most pervasive organizational affiliation represented in the sample. There was no significant difference between Protestants and Roman Catholics in attendance frequency. Therefore, it is used here as a crude indicator of organizational membership intensity.

(d) Number of the county's "Top-Twenty" dairymen with whom respondent is acquainted. The county extension

staff acted as a panel of judges in selecting the "Top-Twenty" dairy farmers in the county. Since the county agents naturally make their selection from among the dairymen with whom they are acquainted, it is quite probable there is a latent factor involved here: This list of 20 farmers may represent the "cream" of the dairymen who participate in extension activities.[5]

(e) Change between 1962 and 1966 in interaction score. A series of seven sociometric-type questions were asked in each survey about varying interpersonal communicative relationships. An interaction score was given to each respondent on the basis of the number of different names he gave in response to these questions. (Some respondents gave the same

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[5]This observation is substantiated by the reactions of numerous respondents when they first viewed the list. One, in particular, ran his eyes down over the list, and quipped, "Hey, I know what this is supposed to be. These are supposed to be the best farmers in the county! Why the hell ain't I on this card? Who made up this list?" When the interviewer begged innocence, he answered his own question: "That g-- d--- county agent; that's who made up this list. Why I got a better operation than half the guys on this list"! In terms of the information on size of operation and practices utilized gathered in the survey data, he probably did. When queried about that particular respondent, the county agent remarked that he was not too friendly disposed toward extension activities and seldom participated.

name in response to all questions; others responded with several names for each of the questions.) This interaction score is intended as a measure of the expansiveness of the respondent's interpersonal relationships.

(4) Communicative behavior

(a) Number of farm magazines subscribed to.

(b) Extension participation score. An index or scale of participation in extension activities was constructed on the basis of a trace-line analysis (Hartman, Brown and Messersmith, 1968). The nine items in the scale are, with respect to the twelve-month period prior to the interview:

1) Been to any meetings, tours, or field days organized by the county agent or his assistant;
2) The county agent or his assistant been on farm;
3) Been in the county extension office;
4) Received any circular letters from the county agent;
5) Read any articles in the newspaper written by the county agent;
6) Listened to the county agent's radio program;
7) Watched the county agent's TV program;
8) Visited any extension farm demonstrations;
9) Someone in the family in 4-H as a member or an adult leader.

(c) Recalled source of information about increasing milk production being

1) Commercial, or

2) Professional, as opposed to familistic or localistic.

(d) Recalled source of information about using fertilizer to increase crop yields as being

1) Commercial, or

2) Professional, as opposed to familistic or localistic.

(3) Change between 1962 and 1966 in the number of "Top-Twenty" dairy farmers with whom the respondent had conversed within the six-month period prior to interview.

(5) Perceptions and opinions

(a) Respondent's opinion about his still being in dairy farming five years hence. "Probability" is measured by a scale ranging from one to five on the basis of his response to the following choices:

1) I definitely will be (5)

2) I think I will be (4)

3) I'm not sure (3)

4) I don't think I will be (2)

5) I'm certain I won't be (1)

(b) Respondent's self-evaluation of his quickness to adopt new agricultural practices. Adoption proneness is measured by a scale ranging from one to five on the basis of his response to the following choices:

1) Among those who are the first to try out new practices (5)
2) Among those who are next to the first (4)
3) Among those in the middle (3)
4) Among those next to the last (2)
5) Among those who are the last to try out new practices (1)

(c) Respondent's satisfaction with his accomplishments as a farmer. Satisfaction is measured by a scale range from one to four on the basis of his response to the following choices:

1) Very satisfied (4)
2) Quite satisfied (3)
3) So-so (2)
4) Not satisfied (1)

(d) Goal in life ranked highest. Respondents were asked to look at five line drawings depicting five different goals in life and to rank them in importance. They were:

1) being debt free

2) Providing children with a good education

3) Having children marry and live nearby

4) Having modern farm equipment

5) Having modern conveniences in home

(6) Personal and family characteristics

(a) Age

(b) Years of formal education

(c) Number of children living at home

(d) Number of a list of 10 selected household conveniences in the respondent's home. The 10 conveniences are:

1) Complete bath

2) Telephone

3) Automatic washer

4) Food freezer

5) Central heat

6) Clothes drier

7) Automatic dishwasher

8) Electric or gas kitchen range

9) Television set

10) Hi-fi or stereo phonograph

Ecological and Cognitive Factors

Two other variables were considered in the design that are somewhat associated with the demonstration farms. The one variable is that of geographical location near a particular demonstrator. At

first it might seem that this variable should be included among those associated with the program, since there will certainly be a differential influence on diffusion among the demonstrators. However, it is possible that the ecological factors inherent in geographical location exert more of an influence on the diffusion process than does proximity to a particular demonstrator. Land values vary in different areas of both counties depending on soil types, fertility levels, topographical characteristics, accessibility to main roads and trade centers, etc. The areal distribution of ethnic backgrounds is prominent in Susquehanna County particularly. Previous research has shown that ecological factors are important facilitating or limiting conditions in the diffusion of innovations, and preliminary examination of a number of the independent control variables revealed significant areal distributions indicating the influence of ecological factors.

The other variable is, in part, a response to the act of having received the messages communicated through the demonstration farm program. It represents a cognitive response to the message received, because it manifests a cognitive restructuring involving the information received. Two questions were asked of those respondents who knew about the demonstration farm program to determine the extent of this cognitive restructuring which had taken place. They were:

(1) Have you talked to anyone else about some of the things taking place on the demonstration farms?

(2) Have any of the results on the demonstration farms made you think about changing some of your farming practices?

It is assumed that as these two questions are responded to positively, there will be a concomitant tendency to be characterized by higher positive levels of change in practice usage.

Least Squares Multiple Analysis

As has been indicated, there are many factors operating in the variability of the change in practice usage. One method that allows the assessment of the individual and joint effects of a multitude of possible contributing factors is multiple linear correlation analysis. This technique permits the inclusion of multiple effects, and by assessing the relative importance of each component, it provides information relevant for assigning differential weights to each, and thereby enabling a ranking of the factors.

The 38 variables described above will be included in a least squares regression analysis (Hallberg, 1967). The qualitative, or discrete, variables among them will be included by the use of a dummy variable technique in which each category of the qualitative variable will be treated as a dichotomous variable quantified as unity or zero, indicating whether it applies or not. These "dummy" variables will then be incorporated into the analysis and treated

as real variables.[6] This procedure, however, increases the number of "independent" variables from 38 to 56 in Indiana County and 58 in Susquehanna County, the latter county having two more demonstrators than the former.

The statistic that will be used for analytical purposes is the beta coefficient. Beta weights will be used to compare the independent variables as to their relative ability to produce change in the dependent variable--change in practice usage within the statistical design.[7] There are differences in scales and the units of the scales used in measuring the independent variables. The beta weight, therefore, is appropriate for this task, since it is a standardized partial regression coefficient, obtained by

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[6]It must be remembered, however, that statistics generated for these dummy variables are applicable only to those cases which fall within the category of the original qualitative variable represented by the "dummy" variable. For example, if the dummy variable representing the choice of the goal in life "being free of debt" produces a beta coefficient of .106, this statistic can be generalized as applying to the "influence" of one's life goal only among those respondents who selected this goal. The relative influence of one's life goal upon variation in the dependent variable for the respondents who choose other goals must be inferred on the basis of the beta coefficients obtained for the dummy variables representing each of those goals.

[7]It is recognized, of course, that the phrase "relative ability to produce change in the dependent variable" used here refers only to the relationship that exists within the statistical design. It is not to be inferred that the statistical relationship, in terms of direction of causality, prevails among the referents of these variables in the real world.

multiplying the partial b times the ratio of the standard deviations of the independent variable to the dependent variable.

$$\beta_{12.3\ldots n} = b_{12.3\ldots n}\frac{s_2}{s_1}$$

The beta weight for a variable indicates how much change in the dependent variable is associated with a standardized change in that independent variable when the other independent variables are controlled. We are interested in the relative importance of the various independent variables. Therefore, the beta coefficient would seem to be a more appropriate statistic than the partial correlation coefficient, for example, which is most often used in multiple analyses. The partial correlation coefficient measures the degree of relationship. It is already known from previous research that many of the control variables which are utilized in the present analysis are related significantly to the adoption-diffusion process. We are not particularly interested in learning how much of the variation in practice usage can be explained by individual independent variables. We are interested, rather, in comparing how much change in the dependent variable is possibly contributed by the various independent variables according to their relative importance in explaining change. The multiple correlation coefficient, R^2, expresses the fraction of variance explained by all of the independent variables operating together.

Normal Distribution of the Dependent Variable

One of the basic assumptions in the use of regression

analysis is the normality of the dependent variable. Accordingly, the distribution of the change in practice usage index was submitted to a chi-square test for normality. It was discovered that the distributions for the two counties were significantly different from one another, so the distribution of the dependent variable was tested separately for each county. For Indiana County the chi-square value was 10.25, and the tabular value for acceptance of deviations at the .05 level is 11.07. For the Susquehanna County distribution, the chi-square value was 8.68, and the tabular value at the .05 level is 12.59. Accordingly, the Susquehanna data and the Indiana data are accepted as being normally distributed.

The differences in distribution of the dependent variable between the counties together with the differences in the educational program and significant differences in the distribution of many of the independent control variables provides the rationale for considering each county separately in the multiple regression analysis.

CHAPTER VII

CHANGES IN PRACTICES ADOPTED[1]

With respect to the agricultural practices which were emphasized in the program, there was a differential level in utilization between the counties at the time the program was initiated. Indiana farmers had a mean practice usage index score of .459 in 1962, compared to .374 for the Susquehanna dairymen. With few exceptions, Indiana dairy farmers seem to have adopted the practices in the index more quickly than their counterparts in Susquehanna County.

Changes in Practice Usage Index

Both counties exhibited a positive change in acceptance of practices during the years of the program, although, again, Indiana farmers seemed slightly more favorable toward the adoption of new practices than did the Susquehanna dairymen. The change in the practice usage index for Indiana County was +.110 and for Susquehanna County +.083. This represents the addition of about two practices on the average for Indiana farmers and slightly less than two practices for Susquehanna dairymen. This difference between the counties in the change in practice usage is statistically significant at the .05 level.

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[1] A description of the samples in both counties and of the gross changes that occurred during the five years of the program is presented in Appendix A.

Although the general tendency was to increase slightly the number of practices being utilized in the farm operation, it is not true that the use of all practices increased. For a few of the practices in the practice usage index there was a net loss in the number of farmers who were utilizing them. As shown in Table 5, the number of farmers who reported they were no longer regularly liming their pasture acreages in 1966 is greater than the number who adopted the practice during the 1962-66 period. It is difficult to determine whether such rejection was temporary, prompted perhaps by the severe drought conditions suffered during the five-year period of the study. In questioning the respondents about their fertility programs, many indicated that their present practices were somewhat atypical because of the dry weather. For example: "It doesn't pay you to put fertilizer and lime in the ground if there isn't any moisture there to get it into the plants." On the other hand, one cannot assume either that new adoptions are permanent.

Top-dressing pasture and grass stands was also a practice that saw a net decline. This was undoubtedly related to the drought. The only practice among those which received considerable emphasis in the educational program which had a substantial loss in the number of farmers employing it, was the use of alfalfa and/or trefoil for grass stands. One of every four dairymen who had alfalfa and/or trefoil acreage in 1962 no longer had such legume acreage in 1966, while only one in those who did not have alfalfa

Table 5. Changes in Utilization of Practices in Practice Usage Index (Indiana and Susquehanna Counties Combined).

Practice	Did not use in either 1962 or 1966	Did not use in 1962 but did in 1966	Used in 1962 but not in 1966	Used in both 1962 and 1966
	- - - - - - - - - - Percent - - - - - - - - - -			
Complete soil test for pasture fields	49	21	10	20
Complete soil test for crop fields	25	26	7	42
Lime pastures regularly	28	13	17	42
Lime crop fields regularly	5	10	7	78
Topdress hay and/or legumes	30	17	21	32
Topdress pasture	54	12	16	18
Fertilize other crops	6	6	6	82
Have alfalfa and/or trefoil	19	9	17	55
Band seed grasses	48	12	14	26
Spray for leaf-hoppers and/or spittle bugs	78	11	7	4
Spray for alfalfa weevil	70	23	3	4
Sowing legumes without a nurse crop	80	20	0	0
Forage testing	84	8	4	4
Use of corn for silage	14	11	8	67
Atrazine for weed control on corn	44	33	5	18
Side-band placement on corn planter	62	19	8	11
Plant corn after corn	47	45	2	6
DHIA or other production records	61	11	11	17
Keeping of complete farm account records	29	24	17	30

and/or trefoil acreage introduced it into their cropping program during that period.

The greatest net increases occurred among spraying practices and in practices related to the planting of corn. The sizeable net increase in the use of insecticide for the control of alfalfa weevil, as well as the high proportion of "non-use" in 1962, may be partly attributable to the fact that immediately prior to the beginning of the educational program heptachlor and other chlorine hydorcarbons generally used in weevil control were declared non-usable on forage for milk cattle. Residues of the pesticide had been detected as having been translocated through the alfalfa plant itself and in the milk of cows having been fed with treated alfalfa. Since no tolerance levels had been established at that time for milk, use of the pesticides was banned. By the end of the program, new pesticides had been developed for weevil control which did not have the disadvantage of the chlorine hydrocarbons.

The use of the herbicide "Atrazine" for weed control with corn also manifested a substantial net increase in acceptance. Although some farmers were concerned about the effects of "Atrazine" residue left in the soil on successive grass or grain crops following corn in the crop rotation, six farmers adopted "Atrazine" for every one that rejected it during the period of the program. There were also substantial net increases in the use of side-band placement attachements on corn planters and the practice of successive planting of corn in the same fields for a period of two or more years.

A new practice, sowing legumes without a cover or nurse crop (usually of oats), was introduced into the two counties during the period of the educational program. By 1966 it had been accepted by one-fifth of the farmers in the sample.

Relation of Change in Practice Usage Index to Initial Level

An examination of the program content reveals that few of the recommended practices which received emphasis on the demonstration farms were really completely new in 1962. Therefore, we would expect that innovators, or even early adopters, would not be persons most influenced by the demonstration farm program. One of the assumed primary functions of the result-demonstration is to have neighbors influence neighbors. The innovator, or early adopter, on the other hand, is influenced more by mass media or specialized sources relatively close to original information sources (Copp, Sill and Brown, 1958; Lionberger, 1960:42-66; Rogers, 1962:148 253). Whether the change which occurred was a result of the influence of the demonstration farm program or of extraneous factors related to the adoption-diffusion process, it was expected that those farmers who would exhibit the greatest amount of change in practice usage would be those who entered the five-year observation period with relatively low levels of practice usage. Early adopters are also involved in change, but they were, in a real sense, "ahead" of the demonstration program. They were adopting practices which were generally of more recent vintage than most of those which received emphasis in the program.

Accordingly, it was expected that there would be a negative correlation between the change in practice usage and the initial level of practice usage. This expectation was supported by the data. The zero-order correlation coefficient (r) for the relationship of the dependent variable with the 1962 practice usage index is -.258 for Indiana County and -.277 for Susquehanna County. These values are significant: at the .01 level for Indiana County and at the .001 level for Susquehanna County.

The shift in the distribution of the practice usage index scores is shown in Tables 6 and 7. It must be remembered that a change of +.1 in the practice usage index prepresents the acquisition of approximately two new practices. Therefore, those farmers who shifted more than one bracket higher in the tables adopted more than four new practices. One-tenth of the farmers in both counties increased their scores by at least this much.

Table 6. Shift in Distribution of Practice Usage Index Scores from 1962 to 1966, Indiana County (Figures in Cells are Percent).

1962 Practice Usage Index Score	1966 Practice Usage Index Score					
	.000 to .200	.201 to .400	.401 to .600	.601 to .800	.801 to 1.000	Totals
.000 - .200	1.4	2.7	0.7	0.0	0.0	4.8
.201 - .400	1.3	9.4	16.2	7.4	0.0	34.3
.401 - .600	0.0	2.7	15.5	16.2	3.4	37.8
.601 - .800	0.0	0.0	6.8	5.4	9.5	21.7
.801 - 1.000	0.0	0.0	0.0	0.7	0.7	1.4
Totals	2.7	14.8	39.2	29.7	13.6	100.0

Table 7. Shift in Distribution of Practice Usage Index Scores from 1962 to 1966, Susquehanna County (Figures in Cells are Percent).

1962 Practice Usage Index Score	1966 Practice Usage Index Score					
	.000 to .200	.201 to .400	.401 to .600	.601 to .800	.801 to 1.000	Totals
.000 - .200	6.7	6.7	5.4	0.4	0.0	19.2
.201 - .400	4.6	10.4	19.2	2.1	0.4	36.7
.401 - .600	0.4	6.7	14.2	10.4	0.8	32.5
.601 - .800	0.0	0.8	2.5	5.0	2.5	10.8
.801 - 1.000	0.0	0.0	0.0	0.0	0.8	0.8
Totals	11.7	24.6	41.3	17.9	4.5	100.0

CHAPTER VIII

DAIRYMEN'S KNOWLEDGE OF THE PROGRAM

The analysis of the impact of the demonstration farm program pivots about two levels in the hierarchy of the objectives of the program. The first concern has to do with the general awareness or knowledge about the program held by the farmers in the neighborhoods surrounding the demonstration farms.

The difference in the scope and organization of the educational programs developed by the Extension staffs in the two counties has already been discussed. Despite these apparent differences in the educational program, however, there seems to be little difference in the level of general awareness of the demonstration farm program between the counties. The proportion of respondents who had heard about the program was exactly the same in both counties, 87 percent.

When asked from what sources they had first gained knowledge of the demonstration farm program, dairymen in both counties indicated that the main initial source of information on the program was the county extension office or staff, either by word of mouth or via extension office mailings. Thirty-five percent of the respondents reported having first heard of the program from the extension staff or office. Another 15 percent read about it in the newspapers. Ten percent said they learned of it from a demonstration farmer.

Sources of Information on the Program

However, when questioned about the channels of communication through which they had received information about the program, a higher proportion of Indiana dairymen reported having read about details of the program in the newspaper, having heard about the program on radio, having been at general agricultural meetings at which the program was discussed, and having discussed the program informally with other farmers than did Susquehanna farmers (see Table 8). About twice as many Susquehanna dairy farmers (26 percent) reported receiving information through television as did Indiana farmers (14 percent), and a few more Susquehanna dairymen stated that they attended events held on demonstration farms than did Indiana farmers.

These results are rather surprising in light of the reported inputs in the education program through each of these channels. There was relatively little reporting of the demonstration farm program in the news media in Indiana County. The results of only two of the demonstration farmers were given publicity. None of the demonstration farms received TV coverage. The results appear to be quite contradictory to what might be expected in light of the information obtained on the educational program.

Frequency of Inaccurate Feedback

When pressed for specific information about what was being demonstrated on demonstration farms, 72 percent of the Indiana dairymen and 75 percent of the Susquehanna farmers responded with

Table 8. General Awareness of the Demonstration Farm Program by Farmers.

	Indiana County	Susquehanna County	Total
	- - - - - - - - Percent - - - - - - - -		
Heard about the program	87	87	87
Read in newspaper about program	75	68	71
Heard on radio about program	48	42	44
Saw TV program on demonstration farms	14	26	22
Attended a meeting at which demonstration farm program mentioned	43	37	39
Attended a meeting or field day on a demonstration farm	36	38	37
Talked to another farmer about the demonstration farm program	31	29	30

details. Of those that responded, 27 percent of the Indiana farmers and 15 percent of the Susquehanna dairymen were "inaccurate" with respect to the emphases of the program. Seventeen percent of the Indiana farmers named soil conservation practices which received no emphasis in the program. Twenty percent spoke about small grains (from the use of specific varieties to cropping practices), when in fact the emphasis in the program was to discourage the use of small grains, particularly oats (which was mentioned most frequently) as a cover crop. Four Indiana farmers responded with "a spring house."

In Susquehanna County, 9 percent of the farmers mentioned "a stone picker." The incidence of inappropriate reports was much lower for Susquehanna County than for Indiana County. Corrected for the difference in sample sizes, the ratio of inappropriate responses was 5:13. However, in both counties responses that were substantially correct were often extremely sketchy and rather incidental to the main thrust of the program.

When asked whether they knew on which demonstration farm the practices they had just named were being demonstrated, 16 percent in Indiana County and 9 percent in Susquehanna County did not know. For those that did respond with names of "demonstration farmers," 37 percent in Indiana County and 12 percent in Susquehanna County gave names of farmers who were not demonstrators. A total of 17 incorrect names were given in Indiana County, four of them being mentioned by four or more respondents. Eleven incorrect names were reported by Susquehanna farmers, only one receiving more than two mentions. The distribution of correctly named demonstration farmers is quite interesting also. None of the Susquehanna demonstration farms failed to be mentioned as a site of practices "known" to be demonstrated in the program (see Table 9). Seven of them shared the number of mentions fairly equally, receiving between 4 percent and 8 percent of the mentions. Demonstrator No. 8, who was quite active in many agriculturally oriented organizations, and whose farm had been used as the Dairy Science Department's Unit-Demonstration Farm in the county for

Table 9. Distribution of Demonstration Farmer Mentions in Response to Where "Known" Practices Were Being Demonstrated.

Demonstrators	Indiana	Susquehanna
	- - - - - - - Percent - - - - - - -	
No. 1	17	7
No. 2	68	5
No. 3	1	8
No. 4	0	4
No. 5	3	5
No. 6	0	4
No. 7	11	5
No. 8	--	21
No. 9	--	41
Total	100	100

several years before the beginning of the TVA Test-Demonstration Program, received 21 percent of the mentions. Demonstrator No. 9 received 41 percent of the mentions. His farm was centrally located in the county, and just shortly before the time of the terminal survey, a highly publicized field day was held on his farm.

In contrast, 68 percent of the mentions in Indiana County were of Demonstrator No. 2, who was the former assistant county agent and on whose farm the one field day during the five-year program was held. This field day was held just six weeks prior to interviewing for the terminal survey. Demonstrator No. 1, who was chairman of the county Extension Executive Committee, received 17 percent of the mentions. Two of the demonstrators received none, and two others received less than 3 percent.

The evidence of the data, with respect to general awareness of the demonstration farm program, therefore, seems somewhat ambiguous. The proportion of dairy farmers who reported hearing about the program was exactly the same for both counties. Looking at the various mass communication channels employed by the extension staffs generally, however, the dairymen in Indiana County seemed to be more aware of communicative messages transmitted about the program than in Susquehanna County. The results seem to be in reverse proportions to the relative amount of messages reported input through these channels by the two county extension staffs. However, with respect to specific information about the program, it appears that Susquehanna farmers have the edge. Proportionately, almost twice as many Indiana farmers as Susquehanna dairymen had inappropriate information about what was being demonstrated on the demonstration farms. The incidence of inappropriate answers was almost three times as great in Indiana County.

Sources of Inappropriate Information

The word "inappropriate" is used here deliberately, rather than the word "inaccurate." It was reported that 17 percent of the Indiana dairymen named various soil conservation practices as things they "knew" were being demonstrated on the demonstration farms. Although soil conservation practices, as such, received no emphasis in the program and all of the demonstrators were generally utilizing good conservation practices, several of the demonstrators did install some tile drainage during the period of the program. At the one field

day in Indiana County (as well as at the two field days in Susquehanna County), one of the University agronomy specialists dug a trench and gave a "demonstrated" talk on soil structure and moisture and drainage problems. A number of the demonstration farms had diversion terraces to which attention may or may not have been called at twilight meetings or during the field day. In other words, conservation practices per se were not considered emphasized in the content of the program, but were nevertheless visible for those who wanted to see them in the operation of the demonstration farms. Likewise, Demonstrator No. 2 in Indiana County built a new spring house--along with other improvements he made in his buildings--during the period of the program. The four Indiana farmers who responded to the question to name things being demonstrated on the demonstration farms with "a spring house" may have been reporting what they perceived being communicated through the channel of the demonstration farms.

The same can be said for the response of "a stone picker" by Susquehanna dairymen. The mechanical stone picker referred to was a publicity lure used by the county extension staff to draw attendance to the field day held on Demonstration Farm No. 9. Much of Susquehanna County is quite rocky, some fields being covered with shale chips to the extent that it is literally difficult to see the soil. A mechanical stone picker is an item of considerable interest, and 9 percent of those who reported being aware of the program indicated the stone picker to be part of the program.

It was also reported above that when they were asked to identify the farms on which the things they reported were being

demonstrated, the Susquehanna dairymen were more accurate in identifying participating demonstration farmers than were their Indiana counterparts. Three times as many Indiana farmers (37 percent) named other farmers who were not demonstrators than did Susquehanna dairymen (12 percent). This high incidence of incorrect names may give a clue to the seemingly inconsistent data on general awareness of the program presented in Table 8 when compared with program inputs reported by the extension staffs. In all instances, the names given were names of other farmers in the county, most of whose farms had been used in the past by the county extension staff for check-plots, short-term demonstrations, and twilight meetings. "Demonstration" is a well-used word in extension vocabulary, and it seems obvious that many respondents did not differentiate what they had heard about the program under study--if, indeed, they heard anything--from numerous other "demonstrations" put on by the extension staff.

Entropy and Redundancy

Part of the explanation of these ambiguous findings may lie in two basic, interrelated concepts in communications theory: entropy and redundancy. Entropy is a measure of the degree of uncertainty, or of randomness, of a communication system in terms of the probability that any particular output is related to a given input. The concept of "entropy" was used initially in the realm of statistical mechanics, where it represents a quantity that is the

measure of the amount of energy in a system that is not available for output. It is directly and inversely related to the degree of organization of a system. If, for example, a communication system, or part of it, is highly organized, i.e., not characterized by a large degree of randomness or uncertainty, the amount of entropy is low, and the amount of systematic, and predictable information which it outputs is high. On the other hand, if the communication system is not highly organized, the probability of any one predictable, meaningful message being output through the system is low.

This is illustrated simply by a deck of playing cards. A deck of cards that has been shuffled thoroughly will be characterized by a high degree of randomness or uncertainty with respect to the probability that any one particular card will be dealt from the deck. In this case, entropy is high. However, if the cards are ordered in an organized fashion, entropy is low, for the uncertainty as to how the cards will be dealt from the deck--if they are dealt systematically--has been removed. Therefore, if a deck has been "stacked," and dealt to a table of bridge players, one might be able to predict with a relatively high degree of accuracy the response of the players in the form of bids. The lowered amount of entropy in the "ordered" cards has increased the probability of predictable responses to the "messages" in the cards. In other words, the success with which a total communication act terminates with any given response is partially, at least, a function of the degree to which the communication system is

organized toward eliciting that response (or, a function of the lack of entropy in the system).

In keeping with the example above, usually the application of the concept of entropy is considered primarily with respect to the source and its related channel(s) for communicating messages (Weaver, 1949; Bateson, 1966; Schramm, 1955). It is evidently assumed that in forms of mass communication there will be a random distribution of levels of organization among the target audience of the communication, i.e., at the terminal end of the communication act. The relative efficiency of the total system, then, would be a function of the amount of entropy in the source.

Applying this concept of entropy to the educational program under investigation, it was assumed that the degree to which the desired response to the demonstration farm program would be elicited from the dairy farmers in Indiana and Susquehanna Counties (i.e., awareness about the program, as well as the adoption of those recommended farm practices which received emphasis in the program) is partially, at least a function of the degree of organization toward that goal of the educational program built around the demonstrations. A highly organized segment of the communication system will be low in entropy, in the randomness of its messages; therefore, the amount of meaningfully organized information which it outputs should be high, and therefore have a relatively greater impact. Since the Susquehanna County program appeared to have a higher degree of systematic organization, it was expected that the effect of the program would be proportionately greater.

Schramm (1955) terms redundancy the other side of the coin from entropy, since it is usually true that entropy and redundancy are inversely proportional to each other. Redundancy is also a measure of certainty or predictability, but it is related to the frequency with which aspects of the message or its signals are repetitious and/or predictably related to one another. Communication requires a balance between the predictable and the unpredictable. There must be enough of the unpredictable to insure against deadening monotony, but enough of the predictable so that the message can be integrated at the same speed it is transmitted and received. Therefore, a certain amount of redundancy is necessary. Languages, for example, tend to have about 50 percent redundancy (Colby, 1958). Even without the presence of noise in a communication channel--distorting, overriding, or interrupting the signals or messages being received--no one ever perceives completely the totality of every message in communication. Redundancy in the system of the signals, or among messages, insures a higher level of accuracy in the reception of communication.

For example, the first time a farmer hears about a new technological development in agriculture, the degree of comprehension will depend partly on how redundant the message is (1) with respect to signals and symbols with which he is already familiar, and (2) with respect to how painstakingly the message is elaborated. If the meaningful content of the message is reiterated at periodic intervals, however, the amount of comprehension will increase, a function of the

redundancy. Therefore, the more often a story is told, the more familiar the receiver becomes with it. This is substantiated by Watson and Gallup's (1955) finding that as the number of different kinds of exposure to Extension information increased, the proportion of farmers or homemakers accepting new ideas increased.

Differential Levels of Entropy Among Communication Receivers

If the apparent equal awareness of the demonstration farm program in the two counties is taken at face value, then the evidence that more Indiana farmers than Susquehanna farmers were receiving messages about the program through numerous communication channels suggests that there is not a random distribution of entropy at the terminal end of the communication system (i.e., among the target farmers) between the two counties as assumed. It would appear that lower levels of organization at the initiating end of the communication system in Indiana County are counterbalanced by higher levels of efficiency in the receiving components of the system. That Indiana dairymen are characterized by a higher level of organization with respect to receiving the style and type of communication messages generally initiated by county extension staffs is supported by other data. The social setting of Indiana County is more "cosmopolite," to use Rogers' (1962:17, 102) term than that of Susquehanna. It is bordered on the southwest by the large dominant Pittsburgh SMSA and on the east by the Johnstown-Altoona SMSA's. There are three communities in Indiana County with populations greater than 2,500 in 1960. Indiana, the county seat, is the location of a university with

an enrollment of 8,500 students. Susquehanna County, on the other hand, has no communities with a population greater than 2,500. Although it is bordered by the Scranton-Wilkes Barre SMSA to the south and the Binghamton SMSA to the north, both of these SMSA's are declining and the residents in Susquehanna County maintain a relatively high degree of social isolation from them. This is reflected in the fact that only 55 percent of the sample takes a metropolitan daily newspaper, either from Scranton or Binghamton. There is no local daily paper in Susquehanna County. In Indiana County 89 percent of the dairymen took at least one daily, while 13 percent received two. The number of Indiana farmers receiving no daily newspaper decreased from 11 to 5 percent during the interim of the program, while in Susquehanna County it increased from 45 to 54 percent. The members of the Indiana sample also had a higher mean level of practice usage (.459 as compared with .374) in 1962. All previous studies have shown a positive association between innovative behavior and exposure to higher technological levels of information.

If there are differential levels of entropy in the initiating components of the communication systems of the two counties, i.e., if the educational program in Susquehanna County is more highly organized with respect to disseminating information about the program to the county's farmers, this would explain in part why responses of farmers reporting knowledge of the program are more appropriate with respect to the declared emphases of the program content and more accurate with respect to identifying the participating demonstrators. Higher levels of entropy in a communication system

result in less predictable--i.e., more incorrect or inappropriate--responses to messages at the terminal end of the system.

In communication systems, one of the functions of maintaining low levels of entropy and reasonably high levels of redundancy is that of overcoming the effects of noise. Noise is that which distorts or overrides the signals or messages in communication, usually as they are traveling through the channel. Broadbent (1962) points out that when people are receiving more than one set of signals at the same time, the interference among signals often creates noise and makes it difficult to recover messages. The receiver "has too much information to handle simultaneously, or he reacts to an unimportant signal when he should be dealing with an important one." Data collected from samples of farmers who attended two of the field days held on demonstration farms would corroborate the fact that noise was distorting the intended messages being directed to the target audience. The primary purpose of the field days was to demonstrate results obtained on the demonstration farms with respect to the central emphases of the program. However, responses elicited from farmers eight months after attending the field days indicates that those in attendance were more likely to recall incidental matters than those associated with the central emphases of the program. For example, when asked what were some of the things they remembered about the field day held on Demonstration Farm No. 3 in Susquehanna County, only 17 percent mentioned the alfalfa seedings without a nurse crop. Yet this was supposed to be the primary demonstration at the field

day. Most of the persons attending recalled the soil profile demonstration, the new barn with its automatic cow feeders, and the machinery display. At the Corn Field Day held on Farm No. 9, the farmers who were in the process of wagon tours of the corn demonstration plots literally abandoned the wagons and their university agronomy specialist guides at the times when a machinery dealer was scheduled to demonstrate the mechanical stone picker.

Relationship of Knowledge About the Program to Program Inputs

Although data are available from only Susquehanna County, it is interesting to see how the general knowledge about the program that farmers have is related to inputs in the program. Table 10 shows a comparison of the relative frequency with which various subject-matter areas appear in two input channels and one feedback register. Column one shows the frequency with which the associate county agent's contacts with the demonstrators focus on the various subject-matter areas. Seventy percent of his visits were concerned with general farm management, corn, soil fertility, the general crop program, the feeding program, and buildings; those six areas sharing that time fairly equally. Only two of these areas--corn and fertility--appear among the four receiving the most newspaper coverage. But legumes, and weed and pest control both received a greater amount of publicity. Soil fertility came third with 12 percent and feeding program fourth (11 percent).

The subject-matter areas perceived by the farmers and reported in the interviews as being identified with the program

Table 10. Comparison of Frequency of Program Content Subject-Matter Areas in Agent's Contacts with Demonstrators, Newspaper Coverage, and Farmers' Reported Knowledge of Program, Susquehanna County.

Subject-Matter Areas	Purpose of Agent's Contact with Demonstrator (n=626)	Newspaper Article Coverage (n=62)	Farmers' Reported Knowledge of Program (n=189)
	Percent		
General farm management	17	3	--[a]
Corn	13	7	25
Soil fertility	12	11	17
General cropping program	11	8	4
Feeding program	10	10	2
Buildings	10	7	--[a]
Herd management	7	5	1
Administration, programming	7	8	0
Legumes	5	14	19
Weed and pest control	5	14	12
Machinery and equipment	1	3	13
Other	2	10	7
Total	100	100	100

[a]Less than 0.5 percent.

are corn (25 percent), legumes (19 percent), soil fertility (17 percent), machinery and equipment (13 percent), and weed and pest control (12 percent). Soil fertility, one of the major thrusts of the program in the eyes of the university-level administrators of the program, was the only subject-matter area that maintained a consistent level of importance among these three input-feedback channels. The high level of "corn" in the feedback is explicable. It was one of the main thrusts of the program in Susquehanna County. Because of the previous

lack of suitable varieties of corn for Susquehanna County's short growing season and its traditional reliance on grassland farming, the presence of corn in the program was quite visible. Problems with alfalfa weevil over the few years prior to the program and the unusual trouble with leaf-hopper and spittle bug the last year of the program, coupled with the introduction of the radical new practice of sowing legumes without a nurse crop probably interacted to make legumes also an important subject for members of the target audience.

The same sort of comparison can be made with respect to the demonstrators. Table 11 shows the proportion of contacts the Susquehanna County's associate county agent made with each of the

Table 11. Comparison of Frequency of Agent's Contact with Demonstrators, Newspaper Coverage, and Naming of Demonstrators by Farmers, Susquehanna County.

Demonstrators	Number of Agent's Contacts (n=626)	Newspaper Coverage (n=62)	Mentioned by Other Farmers (n=172)
	- - - - - - - - Percent - - - - - - - -		
No. 1	9	14	7
No. 2	12	12	6
No. 3	12	14	8
No. 4	9	9	4
No. 5	9	11	5
No. 6	10	11	4
No. 7	8	6	5
No. 8	13	13	20
No. 9	18	10	41
Total	100	100	100

demonstrators, and compares this with the relative newspaper coverage given to each demonstrator, and with the mentions he receives from other farmers with respect to their knowledge about his participation in the program. With one exception, Demonstrator No. 9, the distribution of the agent's contacts among the demonstrators is relatively equal, ranging from 8 percent to 13 percent. Demonstrator No. 9 received 17 percent of the contacts. Newspaper coverage is equally equitable, ranging from 6 percent to 14 percent.[1] The concentration of mentions by other farmers, however, is directed toward Demonstrator Nos. 8 and 9, as mentioned above.

Information Diffusion Through Demonstrator's Conversations with Other Farmers

The demonstrators were in no way committed to cooperate with the evaluative study of the educational program, and only a few could perceive the value of the data they were asked to collect on the contact slips (Figure 4). In addition, they were all having problems keeping up with the records required by their contract, and the prospect of more paper work was viewed negatively. However,

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[1]This distribution is much more equitable than appearances suggest. Demonstrator No. 7, who received only 6.4 percent of the total coverage, lives in the southeast corner of the county, outside of the major circulation area of the local county newspaper. Demonstrator No. 4 was the most independent and least cooperative of the demonstrators. It was not really until the last two years of the program that he "warmed" to his role of demonstrator, and then the very serious illness of his wife restricted his active participation in many of the activities of the program.

several of the Susquehanna County demonstrators were reasonably cooperative in gathering data on their conversations with other farmers, so that a total of 194 interactions were recorded for the two-year period of July, 1963, through June, 1965. A few generalizations about the informal diffusion of information from the demonstration farms can be drawn from the data obtained by the contact-slip technique.

Most of the contacts occurred on their own farm with persons who came to see them. This situation accounted for 44 percent of the contacts they reported. An additional 22 percent occurred on someone else's farm. In other words, two-thirds of the contacts reported were interactions which took place within the context of the farm.

There was also a disproportional distribution with respect to the time of year. One would expect that during certain periods of the year there would tend to be a greater amount of interaction taking place than at other times. July is the month when most contacts were reported (28 percent). This coincides with one of the heavier periods of publicity of the program by the extension staff and is the time when legumes were being harvested and would naturally be a topic of discussion. March ranks second in the number of interactions reported (18 percent). Considering the time factor by seasons, the fraction reported for each is Winter (December, January, February), 8 percent; Spring, 31 percent; Summer, 47 percent; and Autumn, 13 percent. There is no significant relationship between the time of the year and the place where these interactions occurred.

There is a significant relationship, however, between the demonstrators and the place interactions are reported to have occurred. With some demonstrators, reported contacts with other farmers occurred equally on and off their own farm. With the others, however, there seems to be a greater tendency for the reported contact to take place either on their own farm or away from it (see Table 12).

Table 12. Distribution of Location of Interactions of Other Farmers with Demonstrators, Susquehanna County (Percent of 194 Contacts).

Demonstrator	On Demonstrator's Farm	On Another Farm	Other Places	Total
No. 2	9	--[a]	0	9
No. 3	9	3	7	19
No. 5	3	10	10	23
No. 6	5	2	2	9
No. 7	9	3	2	14
No. 8	5	1	5	11
Nos. 1, 4, 9	4	3	8	15
Total	44	22	34	100

$p < .001$

[a]Less than 1 percent.

There is also a significant relationship between the demonstrators and the subject matter which they discussed with other farmers in their contacts (see Table 13). Of the total number of topics discussed in the reported conversations with demonstrators, 60 percent centered around field and crop subjects. The second most frequent topic was that of general herd management, including animal

Table 13. Distribution of Topics of Conversations in Interactions of Other Farmers with Demonstrators, Susquehanna County (Percent of 461 Topics Discussed in 194 Reported Interactions).

Demonstrator	Crop and Field Topics	Herd, Feeding and Milk Production	All Other Topics	Total
No. 2	5	--[a]	4	9
No. 3	10	3	9	22
No. 5	16	5	3	24
No. 6	7	--[a]	2	9
No. 7	9	5	1	15
No. 8	6	--[a]	3	9
Nos. 1, 4, 9	7	1	4	12
Total	60	14	26	100

$p < .001$

[a]Less than 1 percent.

health, feeding, and milk production. This entered into 14 percent of the conversations. General farm management ranked third in frequency, being discussed in 10 percent of the contacts. Buildings and equipment were reported as part of 9 percent of the conversations.

The relationship between time of year and the topics discussed was also significant (see Table 14). One-third of the crop and field discussions took place during July. Again, this underlines the importance of early legume harvests for Susquehanna farmers who tend to depend solely on a grassland and forage crop program. Very few discussions in this subject area occurred from November through February. A disproportionate number of general management discussions took place in the winter and early spring. Of

Table 14. Distribution of Topics of Conversations According to Time of Year (Percent of 461 Topics Discussed in 194 Reported Interactions).

Season	Crop and Field Topics	Herd, Feeding and Milk Production	Building and Equipment	General Farm Management	Other	Total
Winter	4	1	1	3	1	10
Spring	13	5	4	4	1	27
Summer	34	5	4	2	4	49
Fall	9	3	--[a]	1	--[a]	14
Total	60	14	9	10	7	100

$p < .001$

[a]Less than 1 percent

course, this is when the farmer is engaging in decision-making with respect to the coming growing season. This relationship substantiates the finding of Bareiss, Hruschka, and Rheinwald (1962) that the subject of farmers' interests and concerns is related to the time of year when those subjects are most pertinent to his behavioral activity.

CHAPTER IX

RELATIONSHIP OF PROGRAM TO CHANGE IN PRACTICE USAGE

The second major pivot of this analysis and the major objective of the research is to determine the impact of the educational program with respect to its ultimate goal--the adoption of the recommended practices. All of the literature on diffusion indicates that knowledge of a demonstration program or of the program content does not necessarily lead to acceptance of the information imparted therein, either at a mental or a behavioral (adoption) level. The new information must be integrated into the potential adopter's cognitive structure in a way that it will be congruent or consonant with other already positively integrated cognitions.

For example, a dairyman may know that another farmer in the neighborhood is cooperating with Extension as a demonstrator of agricultural practices which Extension is strongly recommending. He may be fully aware that this neighboring farmer, under the supervision of the associate county agent, has sown several fields of alfalfa without a nurse crop, using 2-4DB for weed control. The fact that he knows all this, and even that he may have seen the successful stands of alfalfa which resulted, does not at all guarantee that he will consider following the new procedure himself. There could be many reasons why he may choose not to consonantly integrate the new knowledge into his cognitive system.

That knowledge of the program doesn't insure adoption of its contents is illustrated by the data in Table 15. In Indiana County those farmers who were not aware of the program had a higher mean level of change (.109) than those who knew about it (.095). The difference between these means is not significant. In Susquehanna County, however, there does appear to be a considerable difference in change in practice usage between those who knew about the program and those who did not, although the significance level is only between .10 and .05. Those who knew about the program had a mean change of .086 and those who did not of only .027.

Table 15. Relationship of Mean Change in Practice Usage Index to Awareness of the Program.

	Indiana County	Susquehanna County
No knowledge of demonstration farm program	.109 (20)[a]	.027 (32)
Knew of the demonstration farm program	.095 (128)	.086 (207)

[a]Figures in parentheses are n's for subclasses.

Table 16 shows the difference in mean change in practice usage between those who reported talking to someone else about the demonstration farm program (and its subject-matter content) and those who reported not having done so. In Indiana County the difference is considerable. Those who did not discuss aspects of or information

Table 16. Relationship of Mean Change in Practice Usage Index to Having Talked to Someone Else About the Program.

	Indiana County	Susquehanna County
No knowledge of demonstration farm program	.109 (20)[a]	.027 (32)
Knowledge of program but did not talk to anyone about it	.074 (86)	.086 (135)
Talked to someone else about the program	.138 (42)	.086 (72)

[a]Figures in parentheses are n's for subclasses.

Analysis of variance test of significance indicated the differences among means were significant at the .01 level for Indiana County, but were not significant for Susquehanna County (.10 > p > .05).

about the program with others exhibited only a change of .074 in practice usage, while those who did recorded a change of .138. This difference is significant at the .01 level. In Susquehanna County, on the other hand, it seems to make no difference whether or not those who heard about the program discussed it with anyone else. The level of change is the same, .086. Manifestly expressing one's thoughts in verbal speech together with exchanging ideas with another, such as occurs in discussion, is one process in which cognitive reorganization (or restructuring) may take place. And cognitive reorganization is an intermediate step in the process of the acceptance of new ideas. Therefore, it seems logical that those who recall having gone through this process should exhibit a higher level of change in

the direction of adopting the ideas they admittedly discussed with other people.

It must be stated, however, that the evidence does not indicate whether the respondents' conversations with others about the demonstration farm took place prior to, concurrent with, or following, the changes in practice usage. Although we might speak of the "effect of having talked to someone else about the demonstration farm program," the direction of effect is only an inference from the manner in which we handle the data. It is possible that when they responded to this question in the interview situation, the respondents perceived their positive answers as referring to an information-giving or- exchanging interaction after the fact of adoption, rather than a part of the decision-making process leading to adoption.

Another process in which cognitive integration of new information is more directly involved is that in which the individual consciously evaluates the new ideas with reference to possible changes in his own behavioral practices. Respondents were asked whether the results on the demonstration farms made them think about changing something on their own farm, and then, whether they did, in fact, change something in their own operations as a result of what they saw or knew was demonstrated on the demonstration farm. The relationship of the answers to these two questions to the change in practice usage is shown in Tables 17 and 18. Again, in the instances of both these questions, Indiana County dairymen who had heard about the program but who had not allowed that information to stimulate them

Table 17. Relationship of Mean Change in Practice Usage Index to Results of Demonstrations Having Made Respondent Think About Changing Something on His Farm.

	Indiana County	Susquehanna County
No knowledge of demonstration farm program	.109 (20)[a]	.027 (32)
Results of demonstrations did not make respondent think about changing something on his farm	.081 (78)	.087 (122)
Results of demonstrations did make respondent think about changing something on his farm	.118 (50)	.084 (85)

[a]Figures in parentheses are n's for subclasses.

Analysis of variance test of significance indicated the differences among means were significant at the .01 level for Indiana County, and at the .05 level for Susquehanna County.

toward change exhibit significantly lower levels of change in practice usage than those farmers who had heard about the program and considered making changes or reported actually doing so. In both instances, the differences among the means are significant beyond the .01 level. In the cases of the Susquehanna data, although differences among the groups are significant, the significant difference lies between those who had not heard about the program and those who did, not between those who after learning about something in the program were or were not motivated toward change, either on a cognitive or a behavioral level.

Table 18. Relationship of Mean Change in Practice Usage Index to Whether Respondent Reported Actually Having Tried Out Practices Demonstrated on Demonstration Farm.

	Indiana County	Susquehanna County
No knowledge of demonstration program	.109 (20)[a]	.027 (32)
Have not tried out anything demonstrated on demonstration farm	.083 (78)	.081 (133)
Have tried out something demonstrated on demonstration farm	.114 (50)	.094 (74)

[a]Figures in parentheses are n's for subclasses.

Analysis of variance test of significance indicated the differences among means were significant at the .01 level for Indiana County and for Susquehanna County.

It would seem then that the program appears to have an impact on change in practice usage. In Susquehanna County those dairymen who were knowledgeable about the program did, in fact, have a higher mean level of change in the practice usage index than those who did not. Although the level of confidence for asserting the significance of this difference is only between .10 and .05, when controlling for various levels of cognitive and behavioral activities these differences become significant beyond the .05 level.

Among the Indiana dairy farmers, however, a significant difference in change in practice usage is not exhibited between those who know about the program and those who do not. The significant

difference lies between those who, having heard about the program, have evaluated that information cognitively. The program appears to be making an impact on change, mediated by a more conscious decision-making process.

Relation of Change in Practice Usage to Distance from the Demonstration Farms

Since the basic philosophy underlying the demonstration technique is that neighbor influences neighbor, one would expect to find a relationship between change and the distance from the demonstration farms, if the demonstrations are making any impact on change in the surrounding neighborhoods.[1] Table 19 shows the mean levels of change in practice usage for consecutive concentric circle mile zones from the demonstration farms. In Indiana County, five dairymen residing within a mile radius of the demonstration farms have a mean level of change of .194. With one exception (the two-mile zone) the mean level of change in practice usage decreases in a linear fashion as one moves outward from the demonstration farms. In Susquehanna County the same phenomenon occurs, although the mean values of change are lower. With the exception of the three-mile zone, the figures suggest an almost perfect inverse linear trend in practice usage as one moves away from the demonstration farms.

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[1] In the Review of Literature it was indicated that distance from the demonstration farm has been shown to be related significantly to the rate of diffusion, at least within a five-mile radius of the demonstration farm.

Table 19. Relationship of Mean Change in Practice Usage Index to Distance from Demonstration Farms.

Distance (In Integer Mile Zones)	Indiana County	Susquehanna County
1	.194 (5)[a]	.097 (19)
2	.091 (21)	.072 (55)
3	.144 (27)	.110 (88)
4	.124 (33)	.057 (47)
5	.082 (27)	.037 (20)
6	.028 (16)	-.017 (8)
7	-.102 (12)	-.072 (2)

[a]Figures in parentheses are n's for subclasses.

These results would tend to substantiate that the demonstration farm program is, in fact, exerting an influence on change in practice usage. The zero-order correlation coefficients (r) for this relationship, however, do not indicate as strong a relationship for the Indiana data as might be expected from the grouped data in Table 19. For Indiana County, r = -.106, as compared to Susquehanna County where r = -.165. The Susquehanna r is significant at the .01 level. The r for the Indiana data is only at the .2 level of confidence, although the trend is in the expected direction. It is interesting that the correlation coefficient for the relationship of change in practice usage to distance from the nearest demonstration farm visited in Indiana County is somewhat greater: -.138, although not

quite significant at the .05 level. This would substantiate the assumption that the nearest demonstration farm may not necessarily be the farm toward which a dairyman is oriented. For the Susquehanna data, the r for this relationship is only -.025. This seems to be consistent with the data presented in the section of this chapter on the relationship of knowledge of the program to change. Dairymen in Susquehanna County were oriented to the program in a much more general way, possibly because the various aspects of the program, both in structure and content, were more closely integrated into an organized whole than is true in Indiana County. There, because the educational program was less systematically structured with respect to inducing change among its target audience, dairymen who were influenced by the program were more likely to be deliberately conscious of specific aspects of the program in which they were interested and not so of others. Hence, a higher correlation of change with those farms toward which the dairyman is oriented rather than with simply the nearest point of contact with the program.

Least Squares Multiple Analysis

The dependent variable, change in the practice usage index, was included in a multiple covariance analysis.[2] This technique was employed to assess the individual and joint association of the program-related variables to change in practice usage, controlling for the

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[2]The specific analytical tool employed is that composed by Milton C. Hallberg of the Department of Agricultural Economics and Rural Sociology, The Pennsylvania State University, and programmed for execution on the IBM 360/67. See bibliographic reference, Hallberg (1967).

association of the independent control variables enumerated in Chapter VI. The results of these analyses for Indiana and Susquehanna Counties are shown separately in Tables 20 and 21. The independent variables are listed there in descending order according to size of their beta coefficients.

It is to be seen first that there is considerable variation between the two counties in the ranking of the independent variables according to beta coefficients. There are a few variables that do appear in both lists among those which are exerting the most influence in the statistical design. For example, the change in interactional patterns with the "top twenty" farmers of the county ranks first in Indiana County and second in Susquehanna County. Interestingly, however, the apparent direction of association is the opposite. An increase in the number of the county's top dairymen with whom respondents interacted was associated positively with change in practice usage in Susquehanna County, but negatively in Indiana County.

Degree of acquaintanceship with particular demonstrators also appears to be highly associated with variation in the dependent variable. In both counties the relationship with two demonstration farmers were among the first 10 ranked variables. Several ecological areas also seem to be highly related to the amount of change in practice usage. Two of the first 10 variables in Indiana County, and three in Susquehanna County are dummy variables representing geographical areas whose ecological characteristics are assumed to be the most salient characteristics with respect to association with the dependent variable. With respect to both of these sets of

Table 20. Rank Order of Beta Coefficients for Independent Variables in Indiana County.[a]

Independent Variables	Beta Coefficients
1. Change in number of "top twenty" farmers talked to	-.610*
2. Change in interaction score	.527*
3. Change in equipment score	.445**
4. Located in area of Demonstration Farm No. 3[#]	-.324
5. Degree of acquaintanceship with Demonstrator No. 6	.300
6. Number of demonstrators talked to	.294
7. Located in area of Demonstration Farm No. 4[#]	-.286
8. Leadership score (economically oriented organizations)	.285**
9. Acreage farmed	-.276
10. Degree of acquaintanceship with Demonstrator No. 3	.265
11. Number of "top twenty" farmers known	-.254
12. Age calves weaned	-.238*
13. Talked to someone about the demonstration farm program[#]	.236*
14. Milking-time index score	-.235
15. Attended a field day or meeting on a demonstration farm[#]	-.231
16. Located in area of Demonstration Farm No. 7[#]	.229
17. Change in extension participation score	.228
18. Degree of acquaintanceship with Demonstrator No. 1	.227
19. Change in acreage farmed	-.222
20. Distance to the nearest demonstration farm visited	-.214
21. Located in area of Demonstration Farm No. 1[#]	-.209
22. Opinion about still being in dairy farming five years hence	-.207*
23. Number of farm magazines subscribed to	-.204*
24. Located in area of Demonstration Farm No. 2[#]	-.200
25. Degree of acquaintanceship with Demonstrator No. 4	-.179
26. Professional source of information about fertilizer[#]	.164
27. Frequency of attendance at church	-.160
28. Formal social participation score	-.159
29. Commercial source of information about increasing milk production	-.153
30. Change in fraction of off-farm employment	-.150
31. Professional source of information about increasing milk production[#]	-.144
32. Age	-.137

Table 20. Continued

Independent Variables	Beta Coefficients
33. Household convenience score	.135
34. Gross farm sales	.134
35. Self-perception of adoption proneness	.133
36. Fraction of time in off-farm employment	-.118
37. Years of formal education	-.113
38. Having modern farm equipment--goal in life ranked first#	-.111
39. Located in area of Demonstration Farm No. 6#	.098
40. Extension participation score	.096
41. Change in fraction of income from dairy enterprise	.089
42. Knows some of things demonstrated on demonstration farms#	-.086
43. Degree of acquaintanceship with Demonstrator No. 2	.080
44. Being free of debt--goal ranked first#	.077
45. Degree of acquaintanceship with Demonstrator No. 7	.071
46. Degree of acquaintanceship with Demonstrator No. 5	.070
47. Satisfaction with accomplishments as a farmer	-.066
48. Having children marry and live nearby--goal in life ranked first#	.052
49. Commercial source of information about fertilizer#	.039
50. Change in herd size	-.037
51. Number of children living at home with family	.025
52. Having modern conveniences in home--goal in life ranked first#	.024
53. Distance from the nearest demonstration farm	-.019
54. Providing children with a good education--goal in life ranked first#	.018
55. Results on demonstration farm made think about changing something on own farm#	.016
56. Milking herd size	.009

Analysis of Variance Table

	Sum of Squares	df	Mean Square	F-ratio
Total	3.297	148		
Regression	1.756	56	.0314	1.851
Error	1.541	91	.0169	$p < .01$

Multiple correlation coefficient (R^2) = .533

Table 20. Continued

Independent Variables	Beta Coefficients
F-ratio for the joint effects of the following five program variables on the dependent variable is 2.37, which is significant at the .05 level:	
(1) Degree of acquaintanceship with Demonstrator No. 6	
(2) Number of demonstrators talked to	
(3) Degree of acquaintanceship with Demonstrator No. 3	
(4) Attended a field day or meeting on a demonstration farm	
(5) Change in extension participation score	

* Significantly different from zero at the .05 level.
** Significantly different from zero at the .01 level.
\# Dummy variables.

[a]Zero-order correlation coefficients for the independent variables with change in practice usage are in Table 22.

Table 21. Rank Order of Beta Coefficients for Independent Variables in Susquehanna County.[a]

Independent Variables	Beta Coefficients
1. Number of demonstrators talked to	.567*
2. Change in number of "top twenty" farmers talked to	.448**
3. Degree of acquaintanceship with Demonstrator No. 6	-.336**
4. Located in area of Demonstration Farm No. 8#	.270
5. Degree of acquaintanceship with Demonstrator No. 9	-.262*
6. Number of "top twenty" farmers known	.235
7. Located in area of Demonstration Farm No. 9#	.197
8. Change in fraction of off-farm employment	-.195*
9. Commercial information about fertilizer#	.189*
10. Located in area of Demonstration Farm No. 1#	.180
11. Change in equipment score	.165*
12. Degree of acquaintanceship with Demonstrator No. 8	.162
13. Number of children living at home with family	.151*
14. Change in fraction of income from dairy enterprise	.148*
15. Located in area of Demonstration Farm No. 2#	.140
16. Change in interaction score	.138
17. Degree of acquaintanceship with Demonstrator No. 2	-.137
18. Degree of acquaintanceship with Demonstrator No. 7	-.133
19. Professional source of information about fertilizer#	.121
20. Commercial source of information about increasing milk production#	-.116
21. Degree of acquaintanceship with Demonstrator No. 4	-.114
22. Having modern farm equipment - goal in life ranked first#	.109
23. Being free of debt - goal in life ranked first#	.106
24. Located in area of Demonstration Farm No. 4#	.103
25. Opinion about still being in dairy farming five years hence	.099
26. Degree of acquaintanceship with Demonstrator No. 1	.088
27. Distance from the nearest demonstration farm	-.079
28. Talked to someone about the demonstration farm program#	.078
29. Formal social participation score	-.075
30. Distance to the nearest demonstration farm visited	.074
31. Degree of acquaintanceship with Demonstrator No. 3	-.071

Table 21. Continued

Independent Variables	Beta Coefficients
32. Frequency of attendance at church	.070
33. Age	-.067
34. Extension participation score	-.066
35. Providing children with a good education - goal in life ranked first#	.062
36. Household convenience score	-.057
37. Located in area of Demonstration Farm No. 7#	.056
38. Having modern conveniences in home - goal in life ranked first#	.050
39. Number of farm magazines subscribed to	.047
40. Fraction of time in off-farm employment	-.047
41. Years of formal education	.044
42. Professional source of information about increasing milk production#	-.042
43. Degree of acquaintanceship with Demonstrator No. 5	-.040
44. Satisfaction with accomplishments as a farmer	-.040
45. Results on demonstration farm made think about changing something on own farm	.038
46. Leadership score (economically oriented organization)	-.036
47. Having children marry and live nearby - goal in life ranked first#	-.034
48. Acreage farmed	.032
49. Gross farm sales	.025
50. Attended a field day or meeting on a demonstration farm#	-.022
51. Change in herd size	.021
52. Change in acreage farmed	-.013
53. Milking time index score	-.012
54. Self-perception of adoption proneness	-.010
55. Age calves weaned	.008
56. Change in extension participation	.006
57. Knows some of things demonstrated on demonstration farms#	.002
58. Milking herd size	-.001

Analysis of Variance Table

	Sum of Squares	df	Mean Squares	F-ratio
Total	5.996	239		
Regression	2.329	58	.0386	1.849
Error	3.757	180	.0209	$p < .01$

Table 21. Continued

Independent Variables	Beta Coefficients
Multiple correlation coefficient (R^2) = .373	
F-ratio for the joint effects of the following seven program variables on the dependent variable is 2.35, which is significant at the .05 level. The F-ratio for the combination of the first five is 3.18, which is significant at the .01 level.	
(1) Number of demonstrators talked to	
(2) Degree of acquaintanceship with Demonstrator No. 6	
(3) Degree of acquaintanceship with Demonstrator No. 9	
(4) Degree of acquaintanceship with Demonstrator No. 8	
(5) Degree of acquaintanceship with Demonstrator No. 2	
(6) Degree of acquaintanceship with Demonstrator No. 7	
(7) Degree of acquaintanceship with Demonstrator No. 4	

* Significantly different from zero at .05 level.
** Significantly different from zero at .01 level.
\# Dummy variables.

[a]Zero-order correlation coefficients for the independent variables with change in practice usage are in Table 23.

Table 22. Zero-Order Correlation Coefficients for Independent Variables with Change in Practice Usage Index, Indiana County (Order of Variables is the Same as in Table 20).

Independent Variables	Correlation Coefficient
1. Change in number of "top twenty" farmers talked to	.061
2. Change in interaction score	.156
3. Change in equipment score	.260**
4. Located in area of Demonstration Farm No. 3#	.026
5. Degree of acquaintanceship with Demonstrator No. 6	.240**
6. Number of demonstrators talked to	.156
7. Located in area of Demonstration Farm No. 4#	.068
8. Leadership score (economically oriented organizations)	.059
9. Acreage farmed	.017
10. Degree of acquaintanceship with Demonstrator No. 3	.139
11. Number of "top twenty" farmers known	-.041
12. Age calves weaned	-.178*
13. Talked to someone about the demonstration farm program#	.156
14. Milking-time index score	.142
15. Attended a field day or meeting on a demonstration farm#	.047
16. Located in area of Demonstration Farm No. 7#	.113
17. Change in extension participation score	.133
18. Degree of acquaintanceship with Demonstrator No. 1	-.096
19. Change in acreage farmed	.052
20. Distance to the nearest demonstration farm visited	-.138
21. Located in area of Demonstration Farm No. 1#	-.208*
22. Opindon about still being in dairy farming five years hence	-.179*
23. Number of farm magazines subscribed to	-.093
24. Located in area of Demonstration Farm No. 2#	-.035
25. Degree of acquaintanceship with Demonstrator No. 4	.098
26. Professional source of information about fertilizer#	-.007
27. Frequency of attendance at church	-.070
28. Formal social participation score	.029
29. Commercial source of information about increasing milk production	-.109
30. Change in fraction of off-farm employment	-.013
31. Professional source of information about increasing milk production#	-.055
32. Age	-.096
33. Household convenience score	.157

Table 22. Continued

Independent Variables	Correlation Coefficient
34. Gross farm sales	.143
35. Self-perception of adoption proneness	.017
36. Fraction of time in off-farm employment	-.016
37. Years of formal education	-.020
38. Having modern farm equipment - goal in life ranked first#	-.109
39. Located in area of Demonstration Farm No. 6#	.104
40. Extension participation score	-.048
41. Change in fraction of income from dairy enterprise	.049
42. Knows some of things demonstrated on demonstration farms#	-.113
43. Degree of acquaintanceship with Demonstrator No. 2	.118
44. Being free of debt - goal in life ranked first#	.073
45. Degree of acquaintanceship with Demonstrator No. 7	.121
46. Degree of acquaintanceship with Demonstrator No. 5	.083
47. Satisfaction with accomplishments as a farmer	.027
48. Having children marry and live nearby - goal in life ranked first#	-.045
49. Commercial source of information about fertilizer#	.182*
50. Change in herd size	.229**
51. Number of children living at home with family	.148
52. Having modern conveniences in home - goal in life ranked first#	-.071
53. Distance from the nearest demonstration farm	-.106
54. Providing children with a good education - goal in life ranked first#	.098
55. Results on demonstration farm made think about changing something on own farm#	.055
56. Milking herd size	.037

* Significantly different from zero at .05 level.
** Significantly different from zero at .01 level.
# Dummy variables.

Table 23. Zero-Order Correlation Coefficients for Independent Variables with Change in Practice Usage Index, Susquehanna County (Order of Variables is Same as in Table 21).

Independent Variables	Correlation Coefficient
1. Number of demonstrators talked to	.043
2. Change in number of "top twenty" farmers talked to	.245**
3. Degree of acquaintanceship with Demonstrator No. 6	-.087
4. Located in area of Demonstration Farm No. 8#	.158*
5. Degree of acquaintanceship with Demonstrator No. 9	-.121
6. Number of "top twenty" farmers known	-.119
7. Located in area of Demonstration Farm No. 9#	-.039
8. Change in fraction of off-farm employment	-.132
9. Commercial information about fertilizer#	.183**
10. Located in area of Demonstration Farm No. 1#	.187**
11. Change in equipment score	.150
12. Degree of acquaintanceship with Demonstrator No. 8	.108
13. Number of children living at home with family	.133
14. Change in fraction of income from dairy enterprise	.194**
15. Located in area of Demonstration Farm No. 2#	-.100
16. Change in interaction score	.130
17. Degree of acquaintanceship with Demonstrator No. 2	.018
18. Degree of acquaintanceship with Demonstrator No. 7	-.070
19. Professional source of information about fertilizer#	-.025
20. Commercial source of information about increasing milk production#	-.032
21. Degree of acquaintanceship with Demonstrator No. 4	-.078
22. Having modern farm equipment - goal in life ranked first#	-.043
23. Being free of debt - goal in life ranked first#	-.022
24. Located in area of Demonstration Farm No. 4#	-.063
25. Opinion about still being in dairy farming five years hence	.016
26. Degree of acquaintanceship with Demonstrator No. 1	.162*
27. Distance from the nearest demonstration farm	-.165*
28. Talked to someone about the demonstration farm program#	.048
29. Formal social participation score	-.052
30. Distance to the nearest demonstration farm visited	-.025
31. Degree of acquaintanceship with Demonstrator No. 3	.039
32. Frequency of attendance at church	.090
33. Age	-.193**
34. Extension participation score	-.054
35. Providing children with a good education - goal in life ranked first#	-.022

Table 23. Continued

Independent Variables	Correlation Coefficient
36. Household convenience score	.058
37. Located in area of Demonstration Farm No. 7#	-.071
38. Having modern conveniences in home - goal in life ranked first#	-.009
39. Number of farm magazines subscribed to	.061
40. Fraction of time in off-farm employment	-.006
41. Years of formal education	.119
42. Professional source of information about increasing milk production#	.049
43. Degree of acquaintanceship with Demonstrator No. 5	-.050
44. Satisfaction with accomplishments as a farmer	-.024
45. Results on demonstration farm made think about changing something on own farm	.042
46. Leadership score (economically oriented organizations)	-.038
47. Having children marry and live nearby - goal in life ranked first#	-.021
48. Acreage farmed	.056
49. Gross farm sales	.153*
50. Attended a field day or meeting on a demonstration farm#	.006
51. Change in herd size	.139*
52. Change in acreage farmed	.003
53. Milking-time index score	-.091
54. Self-perception of adoption proneness	.064
55. Age calves weaned	.008
56. Change in extension participation	.067
57. Knows some of things demonstrated on demonstration farms#	.030
58. Milking herd size	.044

* Significantly different from zero at .05 level.
** Significantly different from zero at .01 level.
\# Dummy variables.

variables, the degree of acquaintanceship with individual demonstrators and with the ecological areas, the direction of the relationship is different in the two counties. In Indiana County the degree of acquaintanceship with those particular demonstrators is related positively with the dependent variable. Degree of acquaintanceship with the two particular demonstrators in the Susquehanna regression is related to the dependent variable negatively. The ecological areas producing the greatest amount of effect in Indiana County show an inverse relationship with change in practice usage. In Susquehanna County the direction of the relationship is just the opposite.

The variable "change in equipment score" ranks relatively high in both counties: third in Indiana and eleventh in Susquehanna. In both instances the beta coefficient is significant, in Indiana County beyond the .001 level. It is recognized that this variable may be measuring much of the same dimension of change that the dependent variable is measuring. The process of decision making which results in the purchase of new equipment might very well be part and parcel of the same process in which a farmer decides to make behavioral changes in his operational procedures. It should be noted, however, that in only one instance was an item of machinery included in the construction of the equipment index that was directly related to one of the practices included in the practice usage index (corn planter side-band placement attachment).

It is seen in Tables 20 and 21 that level of significance of the beta coefficients does not seem to be correlated with the magnitude of their values. One might expect that, since the beta statistic is a standardized partial regression coefficient indicating

the relative amount of effect within the statistical design that an independent variable has on the dependent variable, the greater the value of the beta coefficient, the more significantly different from zero it would be. However, this is not necessarily true. The beta weight is standardized by multiplying the comparable partial regression coefficient by the ratio of the standard deviation of the independent variable to that of the dependent variable. This makes some correction for the fact that there are differences in scales involved among the independent variables. However, since the greater the spread about the mean, the larger the standard deviation, variables with a wider range of values will be favored in the standardization process which produces the beta coefficient. Therefore, variables with a narrow range of values, particularly dummy variables, will have a lower beta weight, all other things being equal, than variables whose values are more widely dispersed. It will be noted that most of the variables in the Indiana regression, for example, that have beta values above .200 but are not significantly different from zero, are either dummy variables or those which have a relatively small range in value.

Amount of Variance Explained

Also evident is the fact that the independent variables generally seem to be more highly associated with change in the dependent variable in Indiana County than they do in Susquehanna County. The range of the value of the beta weights is .610 to .009 for Indiana County and .567 to .001 for Susquehanna County. In the Indiana County regression there are 24 variables with beta coefficients equal to or

greater than .200. Only six of the variables in the Susquehanna County analysis have beta weights of more than .200. Although the amount of variance explained by all the variables acting together is significant at the .01 level for both counties, the percentage of variation in the dependent variable explained by the multiple least-squares equation is greater for Indiana County. This is expressed by the R^2 values: .533 for Indiana County, and .373 for Susquehanna County.

Considering all the independent control variables that have been included in the multiple design, and the fact that they have been shown in previous research to be significantly related to the rate of diffusion and/or the adoption process, it is surprising that the amount of variance explained by the least-squares equation is not greater. There are several possible explanations. First, R is a measure of linear relationship. It is a measure of the goodness of fit of the data about the linear least-squares equation. But it is a matter of common observation that some variables are not associated by so simple a relation. The line that best fits the data may be curvilinear. In fact, some of the studies cited in the Review of Literature indicate that the relation of several of the variables to acceptance of new ideas may very well be curvilinear in form, e.g. Cancian (1967). However, to attempt a more complicated regression model including more than 50 variables would be exceedingly impractical. This is especially true when the linear model, although undoubtedly not exact, yields a close enough approximation that it explains as much of the variance as the R^2 values here indicate.

From a substantive perspective, however, the extremely poor "performance," according to beta weights, of numerous of the variables which previous research has shown to be highly correlated with the adoption-diffusion process, raises a serious question about their applicability to what is happening in the diffusion of information from demonstration farms. Although these variables may be important determinants or facilitating conditions of variation in adoption proneness when considering all farmers, they may not be peculiarly applicable with respect to those farmers who are most likely to be the primary targets for a demonstration farm program. Since most of the practices included in the educational program were practices which innovators and early adopters had already accepted (or rejected), the program of necessity was directed toward later adopters. The significant negative correlations between change in practice usage and the initial level in practice usage underlines the reality of this fact. Although some of these variables may be highly associated with the rate of adoption, it may very well be that the strength of the relationship is dependent upon a high level of association with the adoption process at the early stages of diffusion, i.e. among early adopters. In most instances, adoption studies have focused on early adopters. Few, if any, have attempted to discern what factors appear to be related to acceptance of new ideas by laggards, if and when they finally get around to accepting them. Since the majority of the change we are examining in this thesis is that which occurred among those who exhibited relatively low levels of practice usage at the onset of the program, our ability to explain a great deal of the variance by

the use of independent variables generally associated with individuals at the initial stages of the adoption curve is considerably lessened.

Relationship of Factors Associated with the Demonstration Farm Program to Change in Practice Usage

The major focus of our interest, however, is on those factors associated with the educational program. Table 24 contains the beta coefficients for the independent variables associated with the educational program. In both counties the number of demonstrators talked to appears to be relatively important. It is first in Susquehanna County and second in Indiana County in relative amount of association with change in practice usage among the factors pertaining to the demonstration farm program, and first in Susquehanna County and sixth in Indiana County among all the independent variables. There is little similarity between the two counties with respect to the relative influence of the other variables, however. In Susquehanna County, the degree of acquaintanceship to six of the nine individual demonstrators yields beta weights of appreciable value, while in Indiana County only four of the seven beta weights are appreciably large. However, it is noteworthy that seven of the Susquehanna beta weights for degree of acquaintanceship with particular demonstrators are negative, indicating an inverse relationship with the dependent variable. In Indiana County all but one are positive. One would hope that in a demonstration farm program, any sort of relationship with the demonstration farmers would have a positive influence on change. Interestingly, and in the same vein, in both counties "having attended a field day or meeting on a demonstration farm" exerted a negative influence on the dependent

Table 24. Beta Coefficients for Independent Variables Pertaining to the Demonstration Farm Program.

Independent Variables	Beta Coefficients	
	Indiana	Susquehanna
Degree of acquaintanceship with Demonstrator No. 1	.227 (18)[a]	.088 (26)
Degree of acquaintanceship with Demonstrator No. 2	.080 (43)	-.137 (17)
Degree of acquaintanceship with Demonstrator No. 3	.265 (10)	-.071 (31)
Degree of acquaintanceship with Demonstrator No. 4	-.179 (25)	-.114 (21)
Degree of acquaintanceship with Demonstrator No. 5	.070 (46)	-.040 (43)
Degree of acquaintanceship with Demonstrator No. 6	.300 (5)	-.336 (3)
Degree of acquaintanceship with Demonstrator No. 7	.071 (45)	-.133 (18)
Degree of acquaintanceship with Demonstrator No. 8	--	.162 (12)
Degree of acquaintanceship with Demonstrator No. 9	--	-.262 (5)
Distance from nearest demonstration farm	-.019 (53)	-.079 (27)
Distance from nearest demonstration farm visited	-.214 (20)	.074 (30)
Number of demonstrators talked to	.294 (6)	.570 (1)
Attended a field day or meeting on a demonstration farm	-.231 (15)	-.022 (50)
Change in extension participation score	.228 (17)	.006 (56)

[a]Figures in parentheses are ranks of the variables according to the value of their beta coefficients.

variable. This is not the expected effect, nor is it certainly that intended by the county extension staff. When meetings and field days are planned, it is anticipated that the experience of seeing demonstration results, the opportunity of asking questions, and the "testimony"

of the demonstration farmer would all interact to influence the audience farmers positively, if not strongly, in the direction of desired change. However, in the case of the program under study, there apparently were some negative effects.

Data collected at the two Susquehanna field days held on demonstration farms may shed some light on these unexpected and rather surprising findings. Almost one-third of the farmers in attendance at the field days had fairly large operations (milking herd > 45) with high levels of practice usage. With respect to the majority of the practices emphasized on the demonstration farms, these farmers had already adopted them. Upon questioning, they reported they had come to the field day to compare the results they had obtained on their own farms with those on the demonstration farm. Since some of the practices were relatively new, they evidently had no referents to adequately judge their own performance. Therefore, they reasoned that the achievements of the demonstrator, who "performed" under the supervision of the county extension staff and university specialists, would provide a basis for evaluation of their own achievements. This was a function served by the field days which was neither recognized nor anticipated by the program administrators.

Another group of similar size attending the same field days were dairymen who had full- or part-time off-farm employment. For the most part, these farmers were not in a position to seriously consider the changes in their farming operation which adoption of numerous of the demonstrated practices would require. Their attendance at the field day was a behavioral manifestation of a continuing

interest which could not be manifested by keeping pace in their own farming operations with the modernization in agriculture.

Almost a third of the attendance at the field day were farmers who had essentially retired or who because of advanced age had begun the process of "phasing-out" of full-time farming. Like the group above, although they were extremely interested in the things being demonstrated at the field day, they had no serious intention of considering the adoption of any of the practices. For both of these latter groups the primary function of the field day was to visit with the other farmers in attendance and to be informatively entertained in a subject matter to which they still had only a partial commitment.

This is enough to indicate that most of the individuals in attendance at the field days were far from being representative of the majority of potential adopters of the practices being demonstrated in the total target audience at the time of the educational program. It explains also why attendance at a field day or a meeting on a demonstration farm exercised a negative influence on change in practice adoption, and why in Susquehanna County the variables representing "degree of acquaintance" with a particular demonstrator--in which the highest value was given for visiting the demonstrator's farm--were also negative in the direction of their influence.

This is borne out by the mean levels of change in practice usage for differing degrees of acquaintanceship with each of the demonstrators (see Tables 25 and 26). In Indiana County there seems to be somewhat of a linear trend in practice usage among the levels of

Table 25. Relationship of Mean Change in Practice Usage Index to Degree of Acquaintanceship with Particular Demonstrators (Indiana County).

Demonstrator	Don't Know	Acquainted	Talked to in Past Three Years	Visited Farm in Past Three Years
No. 1	.105 (78)[a]	.091 (12)	.134 (19)	.066 (39)
No. 2	.078 (73)	.142 (10)	.045 (12)	.127 (53)
No. 3	.086 (94)	.084 (15)	.120 (20)	.139 (19)
No. 4	.086 (98)	.095 (18)	.101 (13)	.153 (19)
No. 5	.092 (111)	.079 (11)	.140 (17)	.101 (9)
No. 6	.073 (111)	.140 (9)	.171 (11)	.182 (17)
No. 7	.080 (56)	.062 (21)	.112 (20)	.124 (51)

[a]Figures in parentheses are n's for subclasses.

degree of acquaintanceship with demonstrators Nos. 3, 4, 6, and 7. As the degree of acquaintanceship increases from "don't know" to "acquainted," to "talked to in the past three years," to "visited his farm in the past three years," the mean change in practice usage tends to increase. This trend does not seem to be apparent for the other three demonstrators in Indiana County, nor for any of the demonstrators in Susquehanna. Consistent with the high ranking of "number of demonstrators talked to" in the regressions in both counties are the relatively high mean levels of change in practice usage for the category "talked to in the past three years."

Table 26. Relationship of Mean Change in Practice Usage Index to Degree of Acquaintanceship with Particular Demonstrators (Susquehanna County).

Demonstrator	Don't Know	Acquainted	Talked to in Past Three Years	Visited Farm in Past Three Years
No. 1	.058 (155)[a]	.126 (22)	.121 (20)	.106 (43)
No. 2	.076 (149)	.057 (27)	.114 (22)	.077 (42)
No. 3	.074 (165)	.067 (20)	.116 (19)	.082 (36)
No. 4	.085 (142)	.076 (29)	.072 (23)	.060 (46)
No. 5	.081 (177)	.066 (13)	.090 (26)	.056 (24)
No. 6	.080 (194)	.067 (12)	.092 (24)	.015 (10)
No. 7	.085 (181)	.042 (18)	.093 (11)	.050 (30)
No. 8	.066 (117)	.063 (38)	.116 (27)	.093 (58)
No. 9	.095 (107)	.073 (50)	.056 (20)	.059 (63)

[a]Figures in parentheses are n's for subclasses.

Since the "number of demonstrators talked to" ranks relatively high in importance in both counties among the program related variables, it raises a question as to whether any particular group or groups of demonstrators are communicating with respondents disproportionately more often than others, or whether acquaintanceship with demonstrators is more generally distributed. Without exception, all of the Indiana demonstrators are included almost equally in the combinations of groups of demonstrators with whom respondents reported

having talked to. No pattern of these combinations appears. In Susquehanna County, however, a pattern of variation does manifest itself in the combinations of demonstrators reported talked to. This pattern is associated with the geographical distribution of the demonstrators. In other words, in Susquehanna County, dairy farmers are more likely to be acquainted with that combination of demonstrators who are located in the vicinity of their own farms.

Significance of Joint Effect of Program Variables

Including all the variables which together represent the demonstration farm program in the research design, does the statistical model indicate that the combination of their effects upon the dependent variable is significant? Since there is a wide range of variation in amount of effect,[3] each combination of variables, beginning with the variable having the largest beta coefficient and successively adding that variable with the next largest beta weight (i.e., combinations formed by an inverse escalation procedure) were tested. An F-ratio test was used to determine whether the proportion

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[3] Therefore, we have refrained from implying causation or direction of effect in discussing the relationship of the independent variables to the dependent variable in the design. However, the analytical statistic employed here is the beta coefficient, which is a standardized regression coefficient, and which refers to the amount of influence which an independent variable exerts on the dependent variable in the statistical model, rather than the degree of association. Therefore, the discussion in this paragraph employs the terms "effect" and "influence," in order to be consistent with the meaning of the statistic utilized, without intending to imply actual direction of causation.

of variation in the dependent variable explained by each successive combination of program independent variables is significant. The results of these tests are shown at the bottom of Tables 20 and 21.

In Indiana County the F-ratio for the joint effects of the five program variables having the largest beta coefficients is 2.37, which is significant at the .05 level. These included the degree of acquaintanceship with two of the demonstrators, the number of demonstrators talked to, having attended a field day or meeting on a demonstration farm, and change in the Extension participation score. The inclusion of other less "influential" program variables in the test reduced the relative proportion of explained variation below the level of significance. In the Susquehanna regression, however, the F-ratio for the joint effects of the five program variables having the largest beta coefficients is 3.18, which is significant beyond .01. The inclusion of the next two most "influential" variables in the test reduces the F-ratio to 2.35, which is still significant at the .05 level. Here, the most influential variable is the number of demonstrators talked to, followed by degree of acquaintanceship with six of the demonstrators.

This analytical procedure--the multiple regression analysis--seems to indicate that the demonstration farm program is exerting a significant effect on the change in practice usage in both Indiana and Susquehanna Counties. However, different aspects of the program seem to have different levels of association to that change in the two counties. By the same token, the extraneous factors which influence

variation in the dependent variable in a systematic way also seem to be operating in a differential manner in the two counties. It is quite possible that the latter condition has considerable influence on the former, i.e., the fact that different extraneous factors seemed to dominate in their influence on or association with change in practice usage in the two counties, provided a different set of determining and facilitating (or limiting) conditions within which the program factors operated. This is illustrated, for example, by the fact that in Susquehanna County, which is characterized by a relatively traditional type social situation, attendance at a field day or meeting on a demonstration farm and change in extension participation score have beta weights of negligible value. The program variables which explain a significant proportion of variance are those having to do with interpersonal communication. In Indiana County, however, these two variables representing more formal aspects of the educational program are among the ones which explain a significant proportion of variance.

CHAPTER X

SUMMARY AND CONCLUSIONS

Although the use of the result-demonstration technique in Extension education has decreased in recent years, it is still considered as being particularly appropriate for establishing local applicability of new ideas in agriculture. However, the body of literature on result-demonstrations is decidedly more descriptive than analytical. Those studies that attempt to be analytical or evaluative are characterized generally by lack of rigorous design and precise findings.

This thesis is an evaluative analysis of a result-demonstration program carried out in two Pennsylvania counties cooperatively by the Cooperative Extension Service of The Pennsylvania State University and the Tennessee Valley Authority. Its primary objective has been to determine the extent to which the educational program structured around 16 demonstration farms achieved its primary desired results: (1) create an awareness of the subject material content of the program, particularly of selected farm practices, and (2) induce the adoption of these practices behaviorally by the members of the target audience, the dairy farmers in the two counties.

Participant's Knowledge of the Program

The findings of this study indicate that there was a relatively high level of general awareness of the demonstration farm program in the two counties. Eighty-seven percent of the dairy

farmers in both counties reported hearing about the program, despite the fact that there appeared to be considerable difference between the counties in program inputs. Respondents indicated that their main initial source of information on the program was the County Extension Office.

Subsequent information was obtained through mass media channels (newspaper, radio and TV), at general agricultural meetings, and through informal communication with other people, principally farmers. Although program inputs through the newspaper, radio, and agricultural meetings were reported by the Extension staffs to have occurred at lower levels in Indiana County than in Susquehanna County, a greater proportion of dairymen in Indiana County reported obtaining information through these media than in Susquehanna County. This may suggest that because of the differing cultural situations, Indiana County farmers are better "programmed" to attentively perceive relevant information which is channeled in their direction than the Susquehanna dairymen.

However, when the respondents' responses about program content are examined for "correctness" or "appropriateness" with respect to the emphases of the program, the differing proportions of farmers giving appropriate responses in the two counties more closely correlates with the variation in program inputs reported by the two Extension staffs. For example, 27 percent of the Indiana farmers, compared to 13 percent of the Susquehanna dairymen, responded inappropriately to questions about the emphases of the program. Thirty-seven percent of the Indiana dairy farmers also

gave names of other farmers who were not demonstrators in response to queries about where particular demonstrations were taking place. This compares to 12 percent of the Susquehanna dairymen who incorrectly named farmers who were not demonstrators. These results seem to be consistent with the observable differential levels of entropy and redundancy in the communicative organization of the program.

Relationship of Program to Change in Practice Usage

The major objective of this study was to determine the impact of the demonstration farm program on the change in utilization of farm practices among the farmers in the neighborhood surrounding the demonstration farms. Three approaches to the data were utilized to determine whether the educational program in fact had an impact on change in practice usage. First, the mean levels of change of those farmers who knew about the program were compared with those who did not know about the demonstration farms. In Susquehanna County the mean difference appeared to be considerable, but was not significant at the .05 level ($.10 > p > .05$). In Indiana County those who had not heard about the program had a mean level of change in practice usage greater than those who had knowledge of it.

Three manifestations of cognitive activity were then introduced as intervening variables in this relationship. They were: (1) discussions with other farmers about the results on the demonstration farms; (2) results on the demonstration farms having made the respondent think about changing something in his own operation; and (3) actually having tried out something that was part

of the demonstration farm program. Considered within the framework of these various levels of cognitive integration, knowledge about the program seems to have an influence on change in practice usage. In Indiana County, among those farmers for whom these intervening variables were applicable, the relationship between knowledge about the program and change in practice usage increased to a significance level beyond .01. Although these cognitive-related variables did not appear to make any difference among the groups of those Susquehanna farmers who knew about the program, they had the effect of heightening to a significant level the difference between those who knew about the program and those who did not.

The second perspective of viewing program impact was to examine the relationship between the distance from demonstration farms and change in practice usage. If part of the diffusion process is neighbor influencing neighbor, there should be an inverse linear relationship between change and the distance from the point of origin of change. In Susquehanna County the data indicated that just such a relationship did exist--at the .01 level of significance. Although the Indiana data demonstrated the same trend, the relationship was not statistically significant.

The third technique was that of a multiple regression analysis, which enabled an assessment of the individual and joint association of the program-related variables to change in practice usage, controlling for the relationship of 30 other variables known to be associated with the diffusion-adoption process.

There was considerable variation between the two counties in the ranking of the independent variables according to the amount of "influence" they exerted on change in practice usage, as expressed by beta weights. Variables such as leadership in economic organizations and those closely related to management practices ranked much higher among the Indiana dairymen than among their Susquehanna County counterparts. Geographical location appeared more important generally in Susquehanna County. In numerous instances in which the same variables occupied relatively equal ranks, the direction of association was opposite in the two counties. For example, the direction of relationship of acquaintanceship with particular demonstrators was positive, with one exception, in Indiana County. In Susquehanna County, on the other hand, with two exceptions, it was negative.

Comparing the relative extent of association which characterize the relationship of independent variables with practice usage, the correspondingly ranked beta coefficients have higher values in the Indiana regression than in the Susquehanna analysis. Together the joint variation of the 32 independent variables explains 53 percent of the variance in practice usage in Indiana County and only 37 percent in Susquehanna County. In both cases, however, the ratios of regression mean square for all the variables acting together to that of error are significant beyond the .01 level.

With respect to the relative amount of influence exercised by those independent variables associated with the demonstration farm program, some components of the educational program seem to have greater effect in Susquehanna County than in Indiana County. To

number of demonstrators which the respondent had talked to within the last three years of the program ranked first among all independent variables in the Susquehanna regression in relative amount or influence on change in practice usage. The degree of acquaintanceship with six of the demonstrators ranked third, fifth, twelfth, seventeenth, twenty-first, and twenty-sixth, respectively. In Indiana County, the degree of acquaintanceship with a demonstrator ranked fifth among all variables according to beta coefficients. Four nonprogram variables ranked in the first four positions. The number of demonstrators talked to ranked sixth. The degree of acquaintanceship with another demonstrator was tenth. The next two variables were more representative of the total educational program: (1) having attended a field day or meeting on a demonstration farm; and (2) change in extension participation; occupying the fifteenth and seventeenth positions in the total regression, respectively.

In both counties the amount of variance explained by the joint relationship of the five program variables having the largest beta coefficients is significant. The significance level in Indiana County is .05, in Susquehanna County, .01. All of the evidence seems to indicate, then, that the demonstration farm program is making an impact on change in practice usage among members of the target audience.

It must be pointed out that the extent of impact is somewhat limited, that the amount of change apparently wrought by the program is smaller than that which might be expected or desired by the program administrators. One of the possible explanations for

this is that the lapse of time between initiation of the educational program and final measurement of the target audience is too short. If the terminal survey had been made six or seven years following the benchmark study and the initiation of the program, it is quite possible that more changes would have occurred than did in the four-year period reported here.

Implications for Extension

Perhaps one implication of this study for Extension educators is that they have overused the word "demonstration." The term has become so redundant in Extension vocabulary that many farmers apparently did not distinguish the particular five-year demonstration program under study from countless other demonstrations conducted by the Extension office in years past.

Close examination of the inappropriate responses about program content among the farmers of both counties also reveals another important implication for educators in general, particularly those who attempt to operate in informal and relatively unstructured circumstances. Attention to communicative messages is one of the crucial factors in learning. In many informal education situations, attention to the primary intended messages is a function of the control and management of all the messages that are transmitted through the communication channel. In systems in which the receivers of messages are mechanical or electronic, there is usually no problem, since the decoder apparatus is programmed to accept or decode only the desired messages, and all others are ignored.

Often a major cause of failure in a human communication system, however, is that the receiver has too much information to handle simultaneously, and/or he will be reacting to unimportant signals when he should be attending to the important ones or the ones which the sender desires him to perceive. This is particularly true when the desired message being transmitted simultaneously with other messages contains new or unfamiliar information. The attention of the receiver will often be co-opted by that one message containing familiar or already known information, or by the one which transmits the most interesting or startling information. Therefore, for example, the farmer attending an Extension field day may have his attention drawn to a new spring house or (in a drought year) to a soil structure and moisture percolation demonstration rather than to a demonstration on alfalfa seeding without a nurse crop. Or he may recall a mechanical stone picker rather than a discussion and demonstrations on corn plant populations or pop-up fertilizer. In each case, what he perceived or recalled was either something familiar or spectacular, but it was not part of the primary message containing new information which the Extension staffs desired the dairymen carry home with him.

The results of the multiple regression give rise to another implication for Extension education. Although it is often assumed so by the administrators of such programs, target audiences do not necessarily utilize program activities for the same function that educators intend. In examining the data more closely to

determine why, for example, attendance at field days seemed to have a negative effect on change in practice usage, it became apparent that farmers attending the field day were not from the primary target audience that extension assumed would be there. The dairymen in attendance were not primary candidates for adopting the demonstrated practices. One-third of the audiences were early adopters who were already using the practices and were utilizing the field day to evaluate their own performances. Another large group were retired and older farmers who were "phasing out," and whose interest in the demonstrations was not with the view of possible adoption of them. Most of the balance of the audiences was composed of part-time farmers who had neither the resources nor the commitment to integrate many of the demonstrated practices into their partial operations.

Limitations and Strengths of This Study

Although this study attempts to be rigorous in its design, there are some limitations which qualify the scope of generalizations that can be drawn from it. The most obvious shortcoming of the study is the lack of a control group. Compensation for this weakeness was attempted by utilizing the multiple variate analysis which controls for relevant factors statistically by introducing them into the design as independent variables. Because of the wealth of literature and research in the diffusion-adoption process, many of the important relevant factors which might affect the results of the research were known.

Another limitation is the scarcity of definitive empirical handles for the educational program to be used as independent program

variables. Because much of the diffusion process takes place in informal and unstructured circumstances, it is exceedingly difficult to determine how to measure varying levels of participation in the program part of the process by the target clientele. Certainly this is a problem that must be solved more successfully in future result-demonstration evaluative research efforts than it is here if the findings are to be more precise. However, the fact that the variables used in this research are relatively comparable in magnitude of influence on the dependent variable to the extraneous independent variables indicates that these variables which were employed do tie in with the educational program in some meaningful way.

A point for possible criticism is the fact that in the practice usage index used to derive the dependent variable in this study, all practices were given equal weight. Previous research has shown that individual practices do differ in perceived importance, in complexity, in compatibility, in relative advantage, etc. No attempt was made, however, to determine how the respondents perceived the practices included in the practice usage index with respect to these dimensions. It is recognized that having considered all practices equally relevant, therefore, may have introduced some error into the variance which is not taken into account in the research design.

On the other hand, this study has several advantages which were not present in much of the previous research. Probably the most commom failing of earlier studies was the selection of the sample. In many cases the sample was extremely small in size and selected in such a manner that it was not representative of the

population to which the results of the research were generalized. The present study employs one of the largest samples of any previous demonstration farm research project. Further, in one sense, it is not a sample, for data were collected from the entire universe of dairy farmers within a four- to seven-mile radius of the demonstration farms.

A second important advantage is that change in practice usage is not determined on the basis of either the memory or the perception of the respondents. Data were collected at two points in time. Each time, information was obtained on current practice usage. The dependent variable, change in practice usage, was derived on the basis of a comparison of the data from these two observations separated by four years.

It has been suggested that with respect to an input-output costs ratio, the result-demonstration method is not a very effective technique for use in Extension. Some researchers have suggested that the role of the result-demonstration appears to be, on the whole, somewhat minimal, that other factors associated with the diffusion process, including other sources of technical agricultural information, may possibly be more influential than the result-demonstration itself. This study did not attempt to include the effect of such other sources of information in the analysis. But although the impact of the result-demonstration method appears to be somewhat limited, the evidence here indicates that it is significant. However, the role played by the result-demonstration certainly appears to be quite variable, dependent, among other things, on the cultural

situation and on how extensively the Extension staff integrates it into an effective educational program.

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